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JOURNAL
OF THE
ASIATIC SOCIETY
OF
✓
BENGAL.

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VOL. XI.

PART I. JANUARY TO JUNE, 1842.

NEW SERIES.

“ It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia* will commit their observations to writing, and send them to the Asiatic Society in Calcutta; it will languish, if such communications shall be long intermitted; and will die away, if they shall entirely cease.”—SIR WM. JONES.

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*Address to Subscribers, by the Editor and late Proprietor of the Journal
of the Asiatic Society of Bengal.*

As my personal interest in the *Journal of the Asiatic Society* ceases from this date, I feel that a few words are due from me in explanation of the change that has taken place in the ownership of the property. I need hardly recapitulate the history of this periodical, which founded by the late Capt. Herbert and Mr. James Prinsep, under the title of *Gleanings of Science*, became the property of the latter distinguished man, and on his succeeding Professor Wilson as Secretary to the Asiatic Society of Bengal, was liberally subscribed to by the Society, and allowed to be known by the name it now bears. The Journal, however, still continued the property of Mr. Prinsep: it was published at his risk and charges, and in the earlier days of its existence hardly repaid its public-spirited proprietor, the money he expended in its publication. He soon, however, created for it, chiefly by the brilliant discoveries made by himself in the Archaeology of India, an European reputation. He was indefatigable in the pursuit of this new subject, and as decypherer of the Lât character; as reader of the unknown language of the Indo-Bactrian coins; as the able guide to the investigations of others, not less than as ably an investigator himself, he took place in the world of literature as Editor of this Journal, with a Raoul-Rochette, a Lassen, or a Grotefend. His labours caused his death: his mind tasked to the carrying on of heavy official duties as Assay-master to a mint, which was then that of nearly all British India, as well as burthened with a multitude of miscellaneous self-imposed occupations, gave way wholly. After months passed in a state bordering upon unconsciousness, he passed away in the prime of life, and the

zenith of a well-earned reputation, a victim to the labour by which it had been achieved.

Mr. Sutherland and Professor O'Shaughnessy, having undertaken jointly the duties of the Secretaryship to the Asiatic Society, consented also to carry on as Proprietors, the Journal published under its special patronage, and after some months' cessation of issue, it re-appeared, and was continued with spirit and success. The Proprietors being anxious, for private reasons, to resign the duties of our Society's Secretariat, made over their Journal to me, when relieved from them by the vote which made me their successor.

It will thus be seen, that I became by this succession the Editor, and *ex-officio* Proprietor, of a periodical publication, which held the anomalous position of being at once patronised, and disowned, by the same Society. Its title bespoke it the property of the scientific body whose name it bore, and by whose Secretary it was edited; the worth of aught that appeared in it redounded to the credit of that Society, while the pecuniary losses, and the actual real risk were borne by the anonymous, but not less real, owner. I need not expatiate upon the personal inconveniences of such a position to myself. The officer of a Society editing its supposed publication, is often addressed in a manner different from that which would have been adopted in speaking to an independent Proprietor. Contributors forgot sometimes that if I did in their opinion mismanage the Journal, I was merely injuring my own property, and not neglecting my duty as the servant of a Society. The impression of the dependence of the Journal upon the Society was moreover combated by no declarations on my part of my right of property. I did not on the occasion of publishing the last Journal of the year, put any prefatory notice to the volume, which the combined numbers would form; and I did not do so, because I felt the incongruity of throwing myself too prominently forward as the Editor of a Journal of General

Science. No one knew better than myself the weakness of my qualification for such a position, nor consequently comprehended better the advantage of conducting my self-imposed duties in an unpretending manner.

About the beginning of the past year, these duties became excessively irksome to me. I possessed valuable assistance in the friendly services ever rendered to me by Mr. Piddington, Curator of the Museum of Economic Geology attached to our Society, and in the able support, always freely, and kindly offered, by Mr. Blyth, the Society's Zoological Curator, but the work was distasteful to me ; the mind must be in a healthy and happy state to support with satisfaction a variety of self-imposed labour, in addition to an onerous weight of ceaseless official duties, and there are necessarily times with all men in which circumstances operate to weaken mental elasticity. I was, furthermore, a good deal discouraged by the impossibility I was in of sending *my* Journal largely to learned bodies, and to men of science in Europe. The Society necessarily declined sending copies of it as from itself, while on the other hand, if I, Secretary to the Society, despatched *my* Journal graced with what would be to all the world a proprietary title as respects the Society, I was guilty of bringing the Society into virtually the very position it was desirous of avoiding, that of identity, namely, with a publication which it did not, and could not controul. At the same time, as Secretary, my duty and inclination ran counter to my interest as Editor and Proprietor ; for my anxious wish was to procure the publication of a volume of the Researches of the Society for the satisfaction of the Members and for interchange with learned bodies in Europe and America ; but the material for such a volume was not forthcoming, as all contributions were for *my* Journal. I could not refuse that promptness of publication, which the contributors had a right to expect ; had I proposed to them to insert their papers in the Researches as part of the contents of a quarto

volume, they would in all probability have withdrawn them altogether. During three years of careful endeavour to get up a volume suitable to the reputation of the Society, I was successful (owing to the want of fit material) in getting authority from the Committee of Papers for only one undertaking, the publication, namely, of the highly coloured specimens in Natural History collected during Sir Alexander Burnes' Mission to Affghanistan, with Dr. Lord's notes upon them, to be edited by Mr. Blyth. In fact, the Journal had absorbed the Researches. Rapidity of publication was become a first want; while the Society, losing its exclusively archæological character, and entering largely into General Science, though it deserved and required an organ through which to speak more than ever, was doomed to compulsory silence by its patronage of the periodical which had superseded its own peculiar publication. The Society patronised, but could not profit by a scientific miscellany, known even in Continental Europe by *its* name.

As nothing could be more unsatisfactory than this state of things as respects the relative positions of the Society I served, and the Journal I owned and edited, I determined upon resigning the Secretaryship, and giving up the Journal. My plans as respected the disposition of the property were not matured, but I availed myself of the kind offer of Mr. Piddington, to edit the remaining numbers of the year 1842, and I withdrew from all connection with the conduct of the periodical about six months ago. I should explain that in using the word property, applied to my Journal, I do not mean to attach to it the idea of value in a pecuniary sense. As a Civil Servant of the Company, I could not engage in the conduct of a publication with reference to its pecuniary value. In the same way as James Prinsep, and Professor O'Shaughnessy, I edited the Journal solely to make it pay for itself, and, as my contributors I trust will acknowledge, spared no expense in maps, in plates, and in plans, to make the publication worthy of the papers

with which they favoured me.* The average income of the Journal during my proprietorship has been about 5,600 rupees a year, and the expenditure about 5,300 Rupees.

At the December Meeting of the Society my resignation was read, and a resolution was recorded by the meeting, that the Journal, which I gave up, should be taken by the Asiatic Society of Bengal, be edited officially by its officers, and acknowledged as its organ of publication. This most wise and excellent determination will I am satisfied prove gratifying to the Members of the Society, and the readers of the Journal generally. It will raise the character of the periodical, and greatly benefit the Society, by affording the means of interchanging papers with other learned bodies, and of making its exertions in the cause of science generally, and actively known. This is hardly the place for me to expatiate upon the flattering manner in which our President, the Honorable W. W. Bird, apprised me of the wish of the Society, that I should resume office as their Secretary, under arrangements which would relieve me of all harassing labours of detail. These arrangements, my sketch of which the Society did me the honor to adopt, included the appointment of Mr. Piddington as Sub-Secretary, by whom with myself, the Journal will be in future edited under the general controul of the Committee of Papers.

This, therefore, is the last time I shall have to address my kind and able supporters as Editor and Proprietor of a publication, which their labours only have given value to. My warmest thanks are due to them not only for their contributions, but for the forbearance they have evinced in all their relations with an over-worked, and, I fear, often too

* I trust I shall be pardoned alluding more particularly to the publication, in a *thirteenth* number during the past year, and its distribution *gratis* to Subscribers. It consisted of the late Capt. Herbert's long-lost Report on the Geology of the Himalayas.

careless Editor. They will I trust continue their invaluable labours for the Society, certain that a greater degree of steadiness and method in the management of the Journal will render it a more worthy medium for the publication of the result of their researches. The Honorable the President has assured the Society of the communication to it as heretofore of such scientific papers, coming as public documents before Government, as it may be deemed proper and expedient to allow the publication of. In short, the Journal leaves my hands with, I trust, the certain assurance, that past support will be continued to it, and with every certainty as respects the internal economy of its conduct, of most material improvement. I conducted it with distaste to the work, under the constant and heavy pressure of other business, and solely as a duty which, rather than let the Journal fall, I undertook, there being for the time no other person willing to become its Editor. The interesting discoveries of James Prinsep, I trusted to see followed up by farther local research on the extension of British influence on a firm basis beyond the Indus, and I looked of course to carry on the communication, at any rate, of facts and observations, upon this important opening into the history of the past people of Central Asia. My three friends, and correspondents from Affghanistan, Lieut. Conolly, Dr. Lord, and Mr. Pigou, were successively killed in action within a short time one of the other. This misfortune deeply discouraged me, and I was never able to arrange so as to supply the loss. Subsequent sad events put a stop to all hope of carrying out in the pages of the Journal, even so much as the record of observations in a field so interesting to the historian and the antiquary. The able support of that eminently accomplished numismatist, Lieut. Cunningham, of the Bengal Engineers, was long afforded me until his undertaking his work on the successors of Alexander in the East, when it was necessarily for a time suspended; and as the increased and increasing demand upon the undi-

vided energies of Europeans in India for the purposes of duty, public or personal, is much opposed to that life of lettered ease, and learned quiet, without which studies in antiquities and philology cannot be systematically and successfully carried on, the publication I edited, deprived of the aid of the eminent few, took the impress of the time, and became more decidedly miscellaneous in its contents than had at any previous period been the case. I do not apologise, however, to my readers for the alteration which the last three years has effected in the general character of the Journal. The original intention of Sir William Jones, when instituting the Asiatic Society, provided in the words which form the motto to the Journal itself, that "its enquiries should be extended to whatever is performed by man, or produced by nature in Asia." I therefore did but carry out this intention. My object has been to make it a Journal of General Science ; as such it has been adopted by the Asiatic Society of Bengal ; as such will it contribute most effectively to the great end of the diffusion of knowledge concerning the land in which we sojourn ; of its thousands of tribes and peoples ; of its history and languages ; of the riches of its mines ; of the resources of its vegetable products ; and of all which men of science are employed about within it to advance the sum of general knowledge in their several departments of philosophical enquiry. I most earnestly entreat all who can do so, to contribute to this great object, and there are few who cannot ; for to observe facts does not require the possession of scientific knowledge, nor is more than the will wanting to report occurrences. Let it too be remembered, that to men of science, so little is India known, that no information given on almost any subject relating to her local peculiarities of circumstance can be wholly destitute of novelty. The exertions of such a man as Brian Hodgson, prove the immensity of new information which is derivable from an examination of the kingdom of nature in even a circumscribed locality. Few, in this country, uniting the acumen of

the archaiologer with the deep observation of the naturalist, would be capable, like him, of creating a European reputation in branches of science of such opposite character ; but all or any can profit by the example which teaches us the newness of the world of nature in which we live, and incites us to supply material for investigation, even if ourselves unable to investigate.

H. TORRENS,

Secretary to the Asiatic Society of Bengal.

JOURNAL

OF THE

ASIATIC SOCIETY.

Extract of a Letter from Dr. JAMESON to Mr. CLERK.

In Camp, Kalabagh on the Indus, November 15th 1841.

Since the 13th ultimo I have been engaged in examining the country between this and Mare. It is not my intention at present to give you any detailed account of the district that I have surveyed, as I am still among the same series of rocks ; viz. Saliferous system ; which extends uninterruptedly from this to Jubalpore.

The coal met with at Kalabagh occurs in thin seams, in a white sandstone that alternates with the red marls in which the rock salt and gypsum are imbedded. The largest seam is in breadth about seventeen inches, consisting partly of coal, sandstone, and mineral sulphur. Already about two thousand maunds have been collected, and brought to the town, which is on the banks of the Indus, from the different localities ; but the people have such ideas of its value, it being used by them for medicinal purposes only, as to demand a most exorbitant price for it, viz. four rupees per pukka maund !

A boat belonging to the Hon'ble Company has been here for five months waiting the delivery of the coal, but the orders issued by the Malik, (Governor,) of the district are, that until it is paid for, none is to be delivered. As the seams from whence the small quantity of coal procured are, owing to their thinness, of no value, and not worth working I shall spend some time here in order to make a minute survey ; I shall then proceed up the river as far as Sharki in the boat, there being no route along either bank, in order to examine the geolo-

gical structure of the country, and at the same time to ascertain if any coal worth working is to be met with.

To the question,—Is any good coal likely to be found in quantity in this district? we would at once answer decidedly in the negative.

In Europe, America, New Holland, &c. the bituminous coal alone is met with in the carboniferous series of rocks. The oldest rock met with between Jabalpure and Kalabagh is magnesian limestone; resting on it we have red sandstone of Europe; on it red marl, in which occur imbedded the rock salt and gypsum, or sulphate of lime, which yields the celebrated plaster of Paris; and alternating with the red marl at Kalabagh there is a white sandstone in which coal and sulphur occur, and alum slate from which alum is manufactured in large quantities; there being in the town fourteen manufactories. In a limestone filled with organic remains, probably the equivalent of the Muschelkalk of Germany, iron ores (red and brown hematite) occur, forming enormous beds. On the banks of the river the sand is extensively washed for gold. And lastly, rock salt and gypsum occur, forming mountains from five to six hundred feet in height.

Such is a rapid account of the riches of this district; and there are few, if any districts in the world where iron, gold, sulphur, salt, gypsum, limestone, saltpetre, and coal are met with in such quantity; and all that is wanted to raise this to one of the most important cities in India, is coal in quantity, enterprise, and a hand to guide.

From the enumeration of the rocks above you will perceive that all are newer than the carboniferous series, the position of the magnesian limestone being immediately above that series in Europe. Sometimes a conglomerate is met with between the sandstone of the coal formation, but that is rare; hence it is known by the local name of the Exeter red conglomerate, Exeter being the locality where it is well developed. From this fact we conclude, that *no coal worth working will be found* in this district. Other seams may be found, and which may yield a few thousand maunds, but no supply to any extent will ever be procured. The coal now met with is partly brown coal (lignite) and partly jet, and *not true bituminous coal*; it however is, from the experiments on a small scale here made, well adapted for steam vessels, &c. burning as it does with good flame, emitting much gas, and at the same time having but a small quantity of earthy matter.

Below the carboniferous series there is another kind of coal met with in the primitive and transition series, viz. glance coal, or anthracite, a non-bituminous coal, which is now extensively used, particularly in America, in steam vessels, but as these rocks are still older than the carboniferous series, none are met with here in situ.

We have made these observations in order that you may decide what is to be done with the small quantity which has been collected. For my own part, I think that the boat might as well have remained where it was, or rather that the individual or individuals who preceded me, ought to have given it as his or their opinion, that the supply would never be commensurate with the demand, even for a single vessel for a few months; and that at the same time the collecting of coal from such small seams would incur great expense to Government. But no doubt the alum slate, which is of a deep black colour, and which occurs in many places along with the coal, was confounded with it, and led to the supposition that coal was to be met with in quantity.

If you think it necessary to send to Bombay any of the coal collected, I may mention that individuals who remove the alum slate from mines here to the place where the coal seams occur, receive one rupee for every sixteen pukka maunds they bring to the manufactory in the town, and it is so near to the river, that no less than half of it was washed away by the late flood.

As I find that it is necessary to go to Peshawur by Cohat, unless I proceed by the right bank of the river, I shall be in this district some ten or twelve days, as it is both an important and interesting geological one. By the district, I mean some 20 coss round. To-morrow I shall be in the immediate neighbourhood. On the 17th, I shall ascend the river in the boat, leaving every thing here, with the exception of a small tent, and shall be absent some six or seven days, depending much, however, on the geological structure of the country. I shall also have ample opportunity of witnessing the devastations of the late flood, the accounts of which given here are awful. I have made a magnificent collection of minerals at the different mines, and intend to send two camel loads for the boat to Bahawulpore, with directions to forward them to Ferozepore. I trust my collection of minerals, birds, &c. will surpass any that have been sent to Calcutta for some time. In addition to the two camel loads of minerals, I have other two camels and three mules loaded with

specimens, so that it is necessity which forces me to adopt the above plan, and here there are thousands of specimens which any collection in Europe would be proud to have. To shew the nature of the coal, I have enclosed specimens, which probably you will think worthy of being sent to the Coal Committee, Calcutta, in order that they may see that it is not true bituminous coal. The rocks illustrative of the district I shall afterwards furnish. I have made a small collection of coins; I send some that appear most interesting; probably you will transmit them to Secretary Torrens, for examination; their history, where found, &c. I shall afterwards send.

On the Literature and Origin of certain Hill Tribes in Sikkim. By A. CAMPBELL, Esq. Superintendent of Darjeeling.

Ilam Sing, Dewan of the Sikkim Raja, who is a Limboo, informs me, that the original country of his tribe is the province of Chung in Thibet, a short distance to the south of Lassa, and that the word "Chong," used by the Lepchas to designate this tribe, is a corruption of the provincial name. He also informs me that in his youth, fifty years ago, he used to see Limboos reading *pothis* in a character, which he believes was peculiar to his tribe, and that he was told by some of the patriarchs, that this character was one which had been compounded from many others, by a sage of the tribe, who had lived at a very remote unknown period. There are now no traces of the existence of a written character peculiar to the Limboos on this side of the snows, and as there is scarcely any intercourse between the southern members of the tribe and their northern progeners, and as those who essay writing in Nipal and Sikkim choose the Nagri character, it is probable that the language of the Limboos will not again be known as a written one on the southern side of the Himalaya.

Regarding the "Murmis," the same intelligent old gentleman tells me, that their Thibetan origin is well established, and known to all well-informed persons, who take an interest in tracing the peculiarities and affinities of the Cis and Trans-Himalayan tribes. Although I have mixed with many Murmis, I have not met with any who could give

me particulars of their Thibetan origin, all being satisfied with the knowledge of their tribe having at some remote period migrated across the snows from Bhote, and with asserting that they had preserved their language (Thibetan) and religion (Bhuddism) unchanged since their arrival. The Murmis are by the Lepchas and the Bhootiahs of Nipal and Sikkim, called "Nishung," which my informant says, arises from their being composed of two families, or divisions; one having migrated from the province of "Nimo" in Thibet, and the other from the district of "Shung" in the same country. Hence the general appellation "Nishung." The Dewan says, that the "Murmis" are a numerous tribe in their original country, through which he has passed *en route* from Sikkim to Lassa, by a road running parallel with the one from Digarchi to that city, but considerably to the eastward of it. He believes that the Murmis on this side of the snow are less changed in habits than any of the other Thibetan ones with which we are acquainted. Of the "Magars" he says, "They are unquestionably a people of this side of the snows, and the original country is Sikkim, from which they were first driven west by the Lepchas across the Mechi and Konki rivers, and thence further west by the Limboos beyond the Arun and Doodkooshi. While in Sikkim they were not Hindoos; they ate fowls, pigs, and everything except the cow, from which I believe they abstained. They had no priests, or *puja* of any kind. Now, however, they have the Brahmins, and are, I believe, reckoned very good Hindoos in Nipal."

As to the "Gurungs," said the Dewan in reply to my questions anent them, "we people of Thibetan origin have nothing to do with them, they belong especially to the central and western parts of the Nipal mountains, and have always, I believe, been less or more followers of Hindooism." The locale of the Gurungs is correctly enough stated here; whether their Thibetan origin can be disproved I know not, but Mr. Hodgson probably can settle the question.

A FIFTH Memoir with reference to the Theory of the Law of Storms in India, being researches about the Madras Storm of May 16th, 1841, and an account of a Whirlwind experienced by the French Ship "Paquebot des Mers du Sud," Capt. P. Saliz, off the Cape. By HENRY PIDDINGTON, Esq.

On the 16th May 1841, a storm was experienced at Madras, severe enough to cause all the ships to put to sea, and one or two vessels were lost along the coast, with several native craft. I am indebted to the very zealous exertions of Capt. Biden, Master Attendant of Madras, for almost all the logs from which I have been able to trace it; and it proves, like those I have hitherto investigated, to have been a true circular storm coming from the E. S. E. the centre passing over Madras, or a little to the northward. My own collection indeed amounts but to one of the logs, that of the *Petite Suzanne*, French ship, which however enables us to estimate the centre for the 15th.*

As before, I give first the documents in the order in which I have used them, and then a statement of the various authorities for the centres marked for the track of the storm at noon each day.

Capt. Biden's Letter says,

Madras, June 2nd, 1841.

"You will have heard of our gale on the 16th; it was partial, and did not blow very hard here; it seems that the vessels which slipped from the roads experienced more severe weather outside. All the 15th, the weather looked suspicious, cloudy, gloomy, and the atmosphere very close. On that evening I despatched a circular through the fleet, advising a good look-out, and due preparation in cases of emergency. The Barometer continued nearly stationary until noon on Sunday; when the surf rose, the breeze increased, and the Barometer fell. I made signals first to prepare, and in an hour afterwards to cut or slip. It blew fresh from N. N. E. at this time, 1 P. M. and at 4 P. M., there was much thunder and lightning with rain; at 7 the gale increased; and about 8, amid torrents of rain, and with a short lull, the gale flew round to the S. S. W.

* I am also indebted to Government for the report from Captain Campbell, Assistant Surveyor General, which enables us to trace the storm in land to Royacottah and Bangalore.

blowing furiously for an hour ; at this time the report from the Observatory, stated ' we expect a perfect hurricane ; be prepared.' I was on the beach all night, and at 11 the Barometer had risen considerably ; the wind abated, and towards day-light we had a strong Southerly wind, with fair weather. You will have observed by the Madras papers, how materially the Barometers differed, but I think the best instrument we have here, is that kept by Lieut. Ludlow, which the scrap of a newspaper states, fell to 29.069. Several ships experienced quite a gale on the 3d of May close to the Line. ' There has been much bad weather all along the Coromandel Coast.'

Madras Gale ; from the Newspaper account.

" On Saturday evening the sun set with every appearance of rain. Accordingly, about seven p. m. the rain commenced, and continued, with but little intermission till early yesterday morning. Between five and eleven p. m. on Saturday, the wind, which had been gradually increasing in violence throughout the day, blew a strong gale, first from the North and then from the South, and for a few minutes, from all points of the compass. At ten a. m. the Master Attendant signalized the vessels in the roads to *slip and make sail*, which was seconded by guns fired from the ramparts; in consequence of which, all the English vessels in the roads immediately put to sea. Their Commanders and Chief Officers were mostly on shore at the time, one of whom offered two hundred rupees for a boat to convey him on board, but without effect, as the sea was running too high for any boat to make the attempt. The *Catharine* was the last that left the roads. Soon after the gale commenced on Sunday evening, two Native Brigs and two Dhonies were driven on shore. One of the former was completely shattered to pieces. A third Dhoney foundered a short distance outside the surf, but the crew had fortunately got into a boat, and were picked up by another Dhoney. The greatest praise is due to the Master Attendant and his Assistant for the judgment, activity, and zeal, displayed by them prior to and during the gale, by which, in all probability, great loss of life was prevented.

" We have not heard of any damage having been done on shore, beyond the blowing down of a tree here and there, and the loss of a few tiles from off sundry old houses.

“ We have received several accounts of the effects of the gale, one of which we herewith append.

“ The gale commenced at about two o'clock on Sunday morning from the North Westward (was not this about the hour of moon rising?) attended with violent squalls and rain, which it was feared, would part the Shipping: however, at day-light, all appeared to be holding on well. At this time, the weather seemed broken, and the Barometer high and steady, though the surf was so high that no boats could go off. From nine till noon, the weather was murky, and unsettled. The Scud was flying, sometimes in a South and South Easterly direction, and so long as the wind hung off the land, no danger to the Shipping was apprehended. At one p. m. indications of bad weather became apparent by the falling of Barometers, and the Surf and Sea rising to an alarming degree, and merging into one, nearly a mile out. The Commanders of Vessels (nearly all of whom were on shore, with some of the Chief Officers) now felt very anxious for the safety of their vessels, especially when it was impossible for them to get off to their ships; which were signalized from the Master Attendant's Flag-staff to prepare for sea, and afterwards to cut or slip, simultaneous with which, guns were fired every *five* minutes for one hour from the Ramparts of the Fort, which latter excellent warning we do not recollect having been adopted for many a year. At this moment, the deepest anxiety was depicted in the countenance of every Commander whilst watching his vessel in the operation of cutting or slipping, which we understand was all done in the quickest and most seaman-like manner, and every vessel safely under-weigh endeavouring to make an offing by two o'clock. Until six p. m. the Barometers continued gradually falling, and the weather assumed a most threatening appearance. Every body who had the shipping interest at heart highly approved of the prompt and judicious steps taken by the Master Attendant, in advising the vessels to go to sea, and felt glad that they were all well outside and clear of the roads. Not so with the Dhonies, which, after observing that all the vessels had been warned and had proceeded to sea, remained, preferring trusting to their fragile ground tackling rather than venture to sea in such tempestuous weather. The consequence was, that two Brigs and one Dhoney came on shore at the Fort after dusk, and one Brig during the night at the Adyar. We also learn that one Dhoney

foundered in the roads, though the crew happily reached another Dhoney in a jolly boat. As far we can learn, we are glad to state, that no lives were lost throughout this catastrophe, though it was difficult to advise the poor creatures (fearful of their safety whilst clinging to the wrecks) not to attempt to leave their vessels until ordered, lest they might be carried under the vessels' bottoms and be crushed by the under-tow of the water; however, fortunately, Mr. McKennie succeeded in this respect.

"We are informed that the conduct of most of the Officers of H. M. 57th Regiment, with many others, namely Doctor Rogers, the Town Major, Captain Noble, Fort Adjutant, Mr. Maclean, the Captains whose vessels had gone to sea, Captain Phillips, Mr. Dallas, and many other gentlemen, was most praiseworthy, for their unwearied exertions and at some risk of their lives, (as it was, we understand, several persons were hurt by the pieces of the wreck, Captain Tapley of the Tenasserim being one) to rescue the poor unfortunate creatures from their perilous situation.

"At eight P. M., the weather moderated, and yesterday morning boats were able to go off to the Dhonies, which are now in the Roads, with the anchors and cables which were wanting. Of course the commanders are anxiously watching and waiting the return of their vessels, and the Master Attendant must have enough to do to recover the anchors and cables from which the shipping have parted and slipped. The wind being southerly, it was yesterday favourable for the vessels to run back again."—*Athenæum*.

From the *Madras Herald* of the 19th instant, we gather a few more items of news, but they are of no great moment:—

'Of the ships which put to sea on Sunday, the *Fortescue* only has returned to the roads. She has, we believe, sustained little or no damage. The *John William Dare*, Captain Shepherd, from Bombay the 24th of April, and Colombo the 11th of May, the *Helen Mary*, Captain Palmer, from Colombo the 10th of May, and the *Champion*, Captain Bentley, from Moulmein the 27th of April, came in yesterday. The first of these three vessels lost her top-masts on the 15th, in a heavy squall, but the second, though she encountered the same storm, sustained no injury. The *Champion* too is all right and tight.

*Extract from the Log of the French Ship, Petite Suzanne, Capt. GARDET,
reduced to Civil Time.*

The French ship *Petite Suzanne* was at noon on the 14th May in lat. $10^{\circ} 21' N.$, longitude by Chr. (from Paris) $81^{\circ} 14' E.$ or $83^{\circ} 34' E.$ from Greenwich, wind WNW. 5 knot breeze, which became variable and calm towards midnight with squalls.

15th. Midnight to noon, winds variable from North to NNW. in puffs, increasing to heavy squalls and rain, sea rising. No observation. Lat. by account $9^{\circ} 25' N.$, longitude $81^{\circ} 40'$ Paris, or 84° London. Noon hove to under close reefed main topsail. P.M. gale from N. to NNW. and NW.—at 5 to 8 NE. to East—at 9, South, and at 11 SSW. blowing a heavy gale. At 11 P.M. almost a hurricane, ship hove to again since 9 P.M. when she bore up for an hour.

16th. To noon wind SSW. At 6 A.M. gale moderating. At $\frac{1}{2}$ past 7 bore up. Noon no observation, lat. account $10^{\circ} 38' N.$, longitude account $84^{\circ} 3'$ Paris, or $86^{\circ} 23'$ London: to midnight winds SSW. and S. and fine.

The Hydroose.

News from Madras received to-day mentions that the *Hydroose*. (Linton,) from Calcutta, bound to the Mauritius, had put into Coringa for repairs, having experienced much squally weather in her passage hence, in which she received much damage. On the 15th ultimo, when in lat. $12^{\circ} 8' N.$ and long. $84^{\circ} 47' E.$ the bad weather began; and on the following morning it increased with heavy gales from E. to N. E., wind shifting to the Westward during the day, with a high sea on—they were then in lat. $11^{\circ} 37' N.$ and long. $84^{\circ} E.$ —the vessel labouring much. At this time she began leaking, and the pumps were kept constantly going; the leak being in no way lessened, and all her sails having been split in a heavy gust, besides a portion (800 bags) of her cargo having been thrown overboard to lighten her, she was obliged to put into Coringa for repairs.—*Calcutta Courier*, June 11.

Master Attendant's Office, Madras.

“State of the Barometer, from the Surveyor's Observatory.—In our notice of the storm which visited Madras on the 16th and 17th inst. in

our last issue, we were incorrect, we find, in assigning 29·31 only as the lowest range of the Barometer; the mercury having stood at 29·069 at 6h. 56m. on the 16th. The following is a memorandum of the range during that day, corrected for temperature, &c., as noted at the Magnetic Observatory by Lieutenant LUDLOW:—

10½ A. M.	29·6505
11 „	·6205
12 Noon.	·5550
2 P. M.	·4625
4h. 41m.	·3190
5 41	·2710
6 41	·1227
6 56	·0690 the lowest, af-

ter which it began to rise.”—*Madras Spectator*.

Ship George the Fourth's report to the Master Attendant of Madras.

“ I beg to say, upon slipping last Sunday, we experienced a hard gale from Northward veering to Westward, with tremendous squalls which lasted till about 4 A. M. The following morning more moderate, and settling into fresh SW^y. Monsoon with fine weather. According to your request, I have sent the indication of Simp. and Bar. together with Lat. and Long. each day at noon.”

Sunday, 16th.	Simp.	Bar.	17th.	Simp.	Bar.	19th.	Simp.	Bar.
2.20 P.M.	29.56	29.34	4.00 P.M.	29.70	29.52	8.00 A. M.	29.90	29.70
4.00	„ 40	„ 23	8.00	„ 72	„ 54	Noon 19th,	„ 87	„ 69
6.00	„ 20	„ 5	4.00 A. M.	„ 74	„ 56	8.00 P.M.	„ 93	„ 76
8.00	„ 50	„ 14	8.00	„ 80	„ 62	8.00 A. M.	„ 96	„ 79
Midnight,	„ 60	„ 40	Noon 18th,	„ 80	„ 62	Noon 20th,	„ 92	„ 76
4.00 A. M.	„ 65	„ 46	4.00 P.M.	„ 80	„ 63	8.00 P. M.	„ 96	„ 79
8.00	„ 73	„ 50	8.00	„ 80	„ 64	Noon 21st,	„ 92	„ 73
Noon 17th,	„ 68	„ 52	4.00 A. M.	„ 80	„ 65	4 A. M.	„ 88	„ 73

	Monday	Tuesday	Wednesday	Thurs.	Friday	Saturday
Latitude, ..	13° 16' N.	13° 14' N.	12° 23' N.	11° 39' N.	11° 38' N.	12° 44' N.
Longitude, ..	81° 9' E.	82° 13' E.	83° 41' E.	83° 56' E.	83° 14' E.	80° 57' E.

Ship City of Poonah's report.

Sunday, 16th May, 1841.—At day light, fresh gale with rain, found the Barque *Ann* driving near to us; at 10 A. M. veered away to 90 fathoms. Barque still driving. At 30 P.M. slipped our chain, and stood

out to sea under treble reefed topsails, fore topmast staysail and double reefed driver. At 4.30 P.M. a sudden shift of wind from SW. with thunder, lightning, and rain, blowing a complete hurricane; carried away larboard quarter boat, and driver boom, split main topsail and foresail. At 8 P.M. brought ship to under bare poles; after, moderated and made sail to the best advantage.

	17th May.	18th May.	19th May.
Latitude,	13° 3' N.	13° 23' N.	13° 10' N.
Longitude,	81° 22' E.	82° 06' E.	81° 54' E.

Barque Tenasserim's report.

Saturday, 15th May, 1841.—First part N. Westerly and NNW. breezes and a confused sea; midnight blowing hard, veered away chain to 65 fathoms.

Sunday, 16th May.—From midnight blowing hard with a heavy sea getting up, daylight blowing very hard from NNE. with heavy appearance and every indication of an approaching gale. About noon, agreeable to instructions per signal from the shore, let go the best bower. At 1 P.M. a very heavy sea struck the ship, carried away all the palls of the windlass and the starboard hawsepipe, and parted the larboard lower chain; finding ourselves in a very critical position with respect to the *George the Fourth*, Indiaman, thought it most prudent to run to sea. Set the foresail, fore-topmast staysail, and close reefed main topsail and trysail, running ESE. At 5 P.M. the gale suddenly abated, and veered round to the S. E., immediately wore ship to the SW., scarcely had we wore round than a tremendous squall from S.E. caught the ship and laid her on her beam ends for a quarter of an hour, split the foresail to ribbands and also the lee clew of the main topsail; whilst in this position the jolly boat was unhooked by the booms, and fell in the water bow foremost, carrying away the topping lifts and guys; was unable to recover her, whilst in this state, therefore cut away the stern falls. About 6h. 30m. a tremendous sea struck us on the larboard quarter, capsized and broke the companion hatch; put the chronometer for safety down below; tremendous hard squalls from the southward; running east under bare poles, the main trysail being split; observed, running apparently before the

wind, a Barque, which obliged us to keep away and shew a light; she passed within a quarter of a mile of us. At 8 P.M. lashed the helm "a lee," and set the fore topmast staysail; shipping immense quantities of water in every direction. Midnight blowing a hard gale from SSW. with a confused sea; during a severe squall, the jib accidentally got adrift unperceived by any one, and was unfortunately nearly all blown away; during the height of the gale the Barometer 28.60.

Monday, 17th May.—A. M. very hard squalls with a heavy sea, vessel labouring heavily (but perfectly tight), gale somewhat abated. About daylight noon, a fresh gale and cloudy weather, lat. observed $13^{\circ} 16' N.$, long. by chron. $81^{\circ} 29'$ —7h. 30m. very heavy, threatening appearance in SW. wore ship to the ESE. and furled the fore topsail; blowing a hard gale with a heavy confused sea, making breaches in every direction, a great quantity passed below, through the companion hatch, though every precaution was used, by nailing planks and double tarpaulins over it. Midnight Do weather—Barometer these 24 hours very unsettled; at midnight, 28.80.

Tuesday, 18th May.—Blowing a hard gale with a high rolling sea, causing the vessel to lurch very heavily; at 1, Barometer 29.00; at 2h, 30m, fell to 28.80; at 3 blowing very severe with a clear sky; 4 moderate; 5h. 30m. wore ship to the westward; daylight moderate and clear, out close reefs; 7, wore ship to the SE., out all reefs; noon, a fresh breeze from SW. with a decreasing sea; latitude observed $13^{\circ} 16' N.$, longitude by chronometer $82^{\circ} 18' E.$

Barque Fortescue's report.

Saturday, 15th May, 1841.—Strong breezes and clear weather, with a very heavy swell; latter part, strong gales and squally weather.

Sunday, 16th May.—Strong gales and squally, people employed preparing ship for sea. At 7 A. M. hauled the long boat and gig alongside in order to hoist them in, found it was impossible to hoist them in, on account of the sea running so high, the long boat swamped alongside, and was obliged to cut them away. Barometer at the lowest 28.78. P. M. strong gales and hard squalls, people employed preparing for sea. At 1 slipped the best bower anchor and 90 fathoms of cable, set fore-topsail, trysail, foresail and main trysail and mizen. At 6, the wind blew a complete hurricane, brought the ship to the wind under reefed

main trysail. At 10, wind more moderate. Midnight, strong gales and hard squalls.

17th May.—Gales and squally weather. Noon, wind more moderate, latitude by observation $12^{\circ} 52'$ North.

17th May.—P. M. North, 5 P. M. NW. 9 P. M. SW. 11 P. M. SSW.

18th May.—P. M. S. by W. Midnight SW.

Barque Jane Blain's report.

Saturday, 15th May, 1841.—Having received instructions from the Master Attendant at 7 P. M. to pay particular attention to Section 15 of the Port Regulations, immediately we braced the yards to the wind and furled the awnings. At 11 P. M. while the master with the watch was on deck, the cable parted at the 30 fathoms shackle, cut away the best bower and veered away to 50 fathoms. At day light made all preparation for sea.

Sunday, 16th May, 1841.—At 1 P. M. we received orders to cut or slip; and run for sea, wind NNE., we slipped our best bower and run according to orders in company with *George the Fourth* and *Fortescue*. At 4 P. M. increasing gale, split the topmast staysail and foresail all to pieces, stowed the remains, lying to under the main trysail. At 4 P. M. blowing a severe hurricane, the main trysail blew all to pieces. At 8 the wind at NW. At 10 P. M. WNW. lying to with a top-gallant studding sail in the mizen rigging, loud claps of thunder and vivid lightning all round the compass.

Monday, 17th May, 1841.—Commences with a severe gale, attended with very hard squalls and rain. At 1 A.M. the wind into the SW. At 2 A. M. South. At 4, wind SSW. Noon, hard squalls and heavy rain, *out all reefs*.

“ We were concerned at hearing of the loss of that well-known country vessel the *Isadora*, which, whilst loading at Vizagapatam, was totally wrecked on the 18th instant; we subjoin an extract from a letter on the above subject.

“ The *Isadora* is a total wreck. Mr. Arbuthnot, the Collector, rendered us most essential service. He and Mr. Conway and several gen-

tlemen attended at the wreck the whole of the first day, and a great part of yesterday, though it was raining and blowing dreadfully, and no sort of shelter. Mr. Arbuthnot got a guard of *two hundred* Sepoys to protect the property, and a party of *fifty* Europeans to save it. Almost the whole cargo was saved, and many of the ship's spars, stores, &c. &c.

“The Brig *Catherine*, which put to sea from the Madras Roads during the gale of the 16th, had reached Vizagapatam on the 20th, says the *Athenæum*, with the loss of her main mast, which it had been found necessary to cut away, in consequence of the vessel having been thrown completely on her beam ends by a sudden gust of wind; she also lost her long-boat, which was cut adrift in the same emergency, at which time an unfortunate lascar was also washed over-board, and perished. In other respects the vessel is uninjured, and the little cargo that she had on board has been landed in good condition.

Extract from the Log of the Barque John William Dare, from Colombo towards Madras, reduced to Civil Time.

Saturday, 15th May, 1841.—P.M. westerly wind, light breezes and cloudy, with a dark appearance to the westward; sunset moderate breezes and cloudy. At midnight strong breezes and dark cloudy weather. At 1, strong puffs of wind. At 4, wind from the west. At 7 A.M. was taken a-back in a severe squall from the Eastward, with lightning and heavy rain; before we could get the ship before the wind, the main topmast went; after that the fore topmast and mizen mast, flying jib boom, end of the jib-boom, spanker, gaff topsail, and all the rest of the sails more or less split in ten minutes, after which the wind veered round to the Westward. At 7h. 30m. Easterly winds; spoke the Barque *Helen Mary*, which supplied us with a fore trysail for a mizen. P. M. wind W. by N. commences with squally weather from the westward. At 3 P.M. a violent squall from the eastward, with heavy rain, finished clearing the wreck. Sunset, strong winds from N. E. and a dark gloomy appearance all round, reefed and set the foresail. At 8 P. M. blowing a gale of wind from the N.W. with constant heavy squalls of rain, a heavy sea getting up, ship labouring much, and shipping a quantity of water on deck.

Sunday, 16th May.—Midnight strong gales of wind with heavy rain at

intervals, ship straining and labouring very heavy, took in the foresail occasionally—Daylight ditto weather, with a high confused sea. Noon more moderate gale, decreasing weather, winds WSW. strong breezes, cloudy, with a heavy sea. Midnight, strong breezes and cloudy, lat. at noon $11^{\circ} 56' N$.

Report from Captain Campbell, Assistant Surveyor General, Madras.

I have the honor to report that the Barometers at Royacottah and Bangalore were affected by the Storm which took place at Madras at 2 A. M. of Sunday the 16th May 1841, and that at Royacottah the force of the gale was felt for some hours.

The observations at Royacottah were made by myself, with an open cistern instrument, on the plan described in the 29th No. of the Madras Journal, with a tube 3-10 inch in diameter, filled and boiled by myself.

The observations at Bangalore were made by the Rev. John Garrett, of the Wesleyan Mission, with one of Newman's iron cistern Barometers, with a tube filled and boiled by myself for the Medical Board at Madras, which on frequent comparison never differed the 1-100th part of an inch from my own.

The observations are reduced, except for temperature, as the variation from 80° of Fahrenheit by either instrument was but three or four degrees.

10 A.M.			4 P.M.		
Royacottah.	Bangalore.	Difference.	Royacotta.	Bangalore.	Difference.
12th,	27,113	0.15	26,991	27,041	0.50
13th,	27,055	0.71	26,949	26,974	0.25
14th,	"	"	26,937	26,958	0.21
15th,	27,023	0.32	26,911	26,948	0.37
16th,	26,963	0.09	26,859	"	"
17th,	26,901	0.55	26,843	26,888	0.45
18th,	26,963	0.44	26,883	26,923	0.40
19th,	27,035	0.48	26,959	26,984	0.25
	27,113				
	26,901				
0.212 Extreme Depression on 17th.					

0.212 Extreme Depression on 17th.

Depression greatest at Royacottah by 0.4 inch.

The very slight variations in the difference of the observations between the two instruments at a distance of forty miles, shews that the observations deserve the utmost confidence. The greatest depression observed was at Royacottah on the 17th, equal to 0.212 inch below the pressure on the 12th.

Observations on the weather at Royacottah on the 16th, at 10 A. M.

Wind N.W. overcast, with Nimbi. Thick in N.E.; lower stratum of clouds moving rapidly with a N.E. current; rain in N.E. and S. at a great distance (forty miles), air very clear. Four P.M. overcast; wind at N. drizzling and heavy rain. At night, about two in the morning, wind increasing to a gale, direction not certain, believed, S.E.; 17th, at sun rise wind quite fallen.

At Bangalore,

16th May.—10 A. M. wind moderate, very cloudy and oppressive. At day-light 5 A. M. Barometer 26·868, rain at night 17th; 10 A. M. very high wind, stormy; it is to be noted, however, that in this month high winds prevail at Bangalore.

It will be remarked that the gale was felt simultaneously at Royacottah and at Madras.

Royacottah, 6th August, 1841.

The *Helen Mary*, in company with the *John William Dare*, had nearly the same weather, but her log affords no Lat. nor Long. from which to deduce her position.

The Barque *Champion* also from Moulmein to Madras, in Lat. $10^{\circ} 1'$ N. to Lat. $9^{\circ} 23'$ had tremendous gusts of wind from WNW. on the 16th, veering to the SW. which seem to have been the usual monsoon; but as there is no longitude with her log it is quite useless as an authority.

The Barque *Ayrshire* from Malacca to Madras has obliged us with a capital log, but she was fortunately for her, though unfortunately for us, in lat. $6^{\circ} 30'$ N. and long. $89^{\circ} 54'$ on the 15th. She had here a heavy SW. monsoon, varying from SbW. to SW.

The *Bengal Merchant* from Moulmein to Madras passed through Duncan's passage in the Andamans on the 15th with strong SEbS. breezes and clear weather, which would agree with the centre of that day if we suppose the storm to have extended so far, which I do not think it did.

The Barque *Catharine*, about midnight on 15th had a shift of wind in a gale from NE. to SW. and from that, to noon 16th, strong gales from SW. being then in $8^{\circ} 27'$ N. and $82^{\circ} 32'$ E. Her vicinity to the high land of Ceylon, and her being considerably to the Southward, with the SW. monsoon blowing strongly, makes her's also a very uncertain datum,

and certainly not to be compared to the exactness derived from that for the Madras ships and shift of wind on this day. I have however marked her position for the 16th and 17th on the chart.

The Barque *Amelia* from Vizagapatam to Madras had heavy gales varying from ENE. to NE. on the 16th in lat. $14^{\circ} 51' N.$; no longitude, given; but she was not very far from the coast, and thus shows clearly enough that the storm extended to about the distance we have taken. As usual she had SE. winds on the following day.

We have two very good stations for this storm, from which we are enabled, I think, to fix its track and rate of travelling with tolerable accuracy. The first of them is on the 15th, when we have the French ship *Petite Suzanne's* log and that of the *Hydroose*, which give a centre at noon on that day about where I have placed it, or in lat. $9^{\circ} 52' N.$ long. $87^{\circ} 12' E.$ We have then Captain Biden's careful account giving the shift of wind at Madras at 8 P. M. on the 16th. Now from noon on the 15th to 8 P. M. on the 16th is 32 hours, and the distance is about 453 miles in that time, or 340 miles in the 24h. or $14\frac{1}{6}$ th per hour. Taking eight hours of this rate, or 113 miles, backwards from Madras on the ESE. and WNW. line of its track, (it will be seen by Captain Biden's letter that at Madras this *was* its track the shift being from NNE. to SSW,) we have for noon of the 16th the spot I have marked, 113 miles ESE. of Madras; and as we find by the various logs of the vessels which slipped from Madras roads, that the shifts or veerings of the wind were between noon and 5 P. M., as they had necessarily run out towards it to get the best offing they could, we cannot be far wrong. This centre of the 16th agrees very remarkably with the log of the *Hydroose*, which vessel had her shift of wind on its track, and if our rate is correct, about 10 hours before noon, or at 2 A. M. of the 16th. It will also, with allowance for the drift (for her track was not the strait line it is laid on the chart) agree very well with the position of the *Petite Suzanne*, which vessel, by the rapid veering of the wind, must have had the centre not far from her at one time; and I attribute to this the anomaly of her having had the wind for about three hours from NE. to East. It will be borne in mind, in considering the two positions of this vessel, that there is good reason to suppose that in these storms strong partial marine currents may be at times created.* We may also remark of her, hat

* Col. Reid, and various logs in my preceding Memoirs.

she is about as far from the centre at noon on the 16th as she was at noon of the 15th, and that the weather seems to have moderated on the former day to about the degree of violence at which it was on the latter, which is also an indirect testimony to the truth of our estimate of the places of the centres. These are tolerable good data for the centre of the 16th, and as the storm was then rapidly approaching the shore, it would as usual, in all probability, begin to show those anomalies which there seems no reason to doubt *do* occur when this is the case. It is most unfortunate that we have not, in the logs of the *J. W. Dare* and other vessels, any computed positions, even by dead reckoning, and not even a longitude! Nothing can more truly show the difficulty we meet with in procuring our information, than the fact, that in this instance, even the Master Attendant of the port could get only returns deficient in one of the most essential points!

I was at first inclined to suppose that the shift of wind experienced by the *Catharine* might have been that of another storm, which reaching Vizagapatam on the 18th was the cause of the loss of the *Isadora*, but the entire want of latitudes and longitudes, and even of the direction of the wind in the storm of the 18th at Vizagapatam, prevent our tracing this theory. Vizagapatam is however such a very unsafe anchorage for a vessel of any size in most weathers, that the *Isadora* may as probably have been wrecked by a strong Southerly gale as by a N. Easterly or Northerly one. I am inclined to suppose that it was merely a *monsoon* gale—*i. e.* the monsoon setting in with the force of a gale; which very frequently occurs.

I have before alluded to the rate of motion of this storm, which was apparently as high as $14\frac{1}{6}$ per hour. I have made the vortex 310 miles in diameter, because I think that the logs of the *Hydroose* and *Petite Suzanne* fairly shew them to be about on the outer verge of the storm at noon on the 15th, and from those of the *Amelia* and *Catherine* to the North and South, with the changes experienced by the *Hydroose* and *Petite Suzanne* to the East, and at Madras to the West, we cannot take it at less on the 16th.

Our only reports of its progress inland, where it would first meet with the lower ranges of the Eastern Ghauts forming the Pulicat Hills, about 60 miles inland from the coast, and successively with those which flank the table lands of Mysore, are those from the Assistant Surveyor General

at Royacottah, and from the Rev. Mr. Garrett at Bangalore, included in his letter. The distance from Madras to Royacottah is about 160 miles W. by S. $\frac{1}{2}$ S. and from Madras to Bangalore about 215 miles W. $\frac{3}{4}$ S.

We see that the centre passed Madras about 8 P.M. on the 16th, and taking it then to have a semi-diameter of about 150 miles, and to have travelled in the same direction as before, it would have passed very considerably to the Northward of these two stations, and should have begun to be felt at Royacottah at 8 P. M. on the 16th; where, as we indeed see, the appearances and wind were suspicious, though unfortunately we have no direction of it marked between 4 P. M. and 2 A. M. where it is only "believed" SE.; which would make the centre pass to the Northward. At Bangalore we have unfortunately no direction of the wind at all!

The Barometrical table however, as compared with that of Madras, is of value, though it would have been far more so had any intermediate heights been observed from between 10 and 4, while the weather was so threatening. Taking the extreme Madras depression to have been at 7 P.M. of the 16th 29.0690, and that of Royacottah and Bangalore at 4 P.M. on the 17th, and that those epochs indicate the passage of the centre, we have then 21 hours for the time it took to travel from Madras to Royacottah, or 160 miles, which gives about 8 miles per hour as its rate of travelling when it reached the land, and had to force its way over ridges of hills; while at sea it was, as we have seen, travelling at the rate of $14\frac{1}{6}$ miles per hour, a very remarkable instance of the effects which ridges of mountains (for Bangalore is at least 3000 feet above the sea, and the crests of some of the Eastern Ghauts thereabout cannot be much less than 5000 feet) produce on the rate of motion of storms from seaward.

It is worth while to compare this retardation from 14 miles to 8 miles per hour, or say one half, with what the Cuttack storm of 1840 (*Third Memoir**) appears to have also experienced from the same cause, but where the ranges of hills were perhaps not so high. This storm seems to have been checked from about 350 miles per day, its greatest rapidity, to 113 and 175 miles, or about one half its velocity on its approach to the land.

We do not know any thing of the Cuttack storm inland. The Madras storm, which we are now considering, seems to have been nearly

* Journal Asiatic Society, vol. ix. p. 1009.

broken up by the time it reached Royacottah and Bangalore, being described only as a gale at the first place, and of short duration, and as a "very high wind" at the latter; and as no damage done by it is mentioned, we may suppose it not to have been very severe? Its centre, if we suppose it to have had one at that time, and to have travelled on the same line, would have passed about 85 miles to the North of Royacottah, and about 50 miles to the North of Bangalore. When we reflect that there is a series of stations in this WNW. line from Madras across to Darwar on the Eastern side of the great chain of the Western Ghauts, and to Rutnagherry on the Malabar Coast, it is not creditable to our brother sojourners in Southern India that not a single report has reached Government *if* the storm extended beyond Bangalore inland. One of the most curious points of research yet to be investigated is this of knowing where, and how, these great whirlwinds disperse; and we might here perhaps have had an instance of a storm being lifted upwards and re-descending when it had passed the barrier of the Ghauts and table land. As things are, we must be content with what we have, and with having, through Captain Biden's zealous assistance, traced out this first of the Madras storms as clearly obeying the general law as to rotation and progression; and also as to what seems to be the usual track of those of the Bay of Bengal. I cannot conclude without earnestly requesting every person into whose hands this Memoir may fall to set down in a few lines the following data, in any storm which may occur, viz.

1. Situation of the observer before, during, and after the storm.
2. The direction of the winds as often as possible.
3. The times of varyings and shiftings of the wind.
4. The state of the Barometer, if any.
5. Any electric or other phenomena.
6. Any remarks and intelligence derived from other quarters.

All this may be done in a very few lines, and the report from it will not take more writing than a short letter. I presume that none are now ignorant of the very great importance of these researches, and at Madras the painful subject of my preceding Memoir, "THE GOLCONDA'S STORM," may have shewn most persons that, one day or other, they may possibly have a personal interest in the full investigation of the THEORY OF STORMS.

PART II.

The Whirlwind of the Paquebot des Mers du Sud, Captain P. SALIZ.

The Mauritius Price Current of 7th and 14th September* 1841, give the following notice of this remarkable phenomenon, and as it is most important to place a good account of it upon record, I have thought it right to print the Mauritius account, with the addition of what I have personally learnt from Captain Saliz.

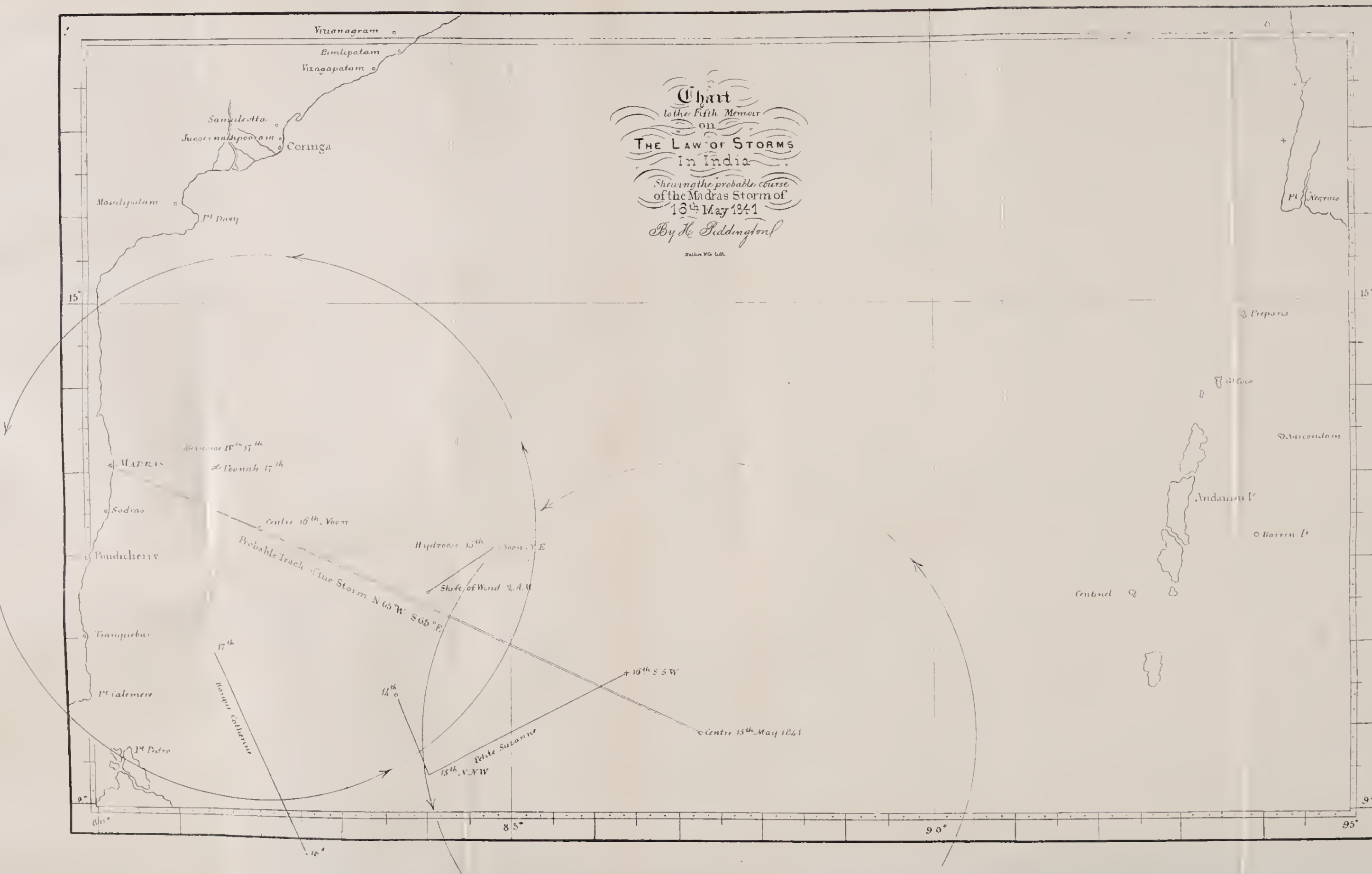
“ Captain Saliz of the French Ship *Paquebot des Mers du Sud*, who arrived here on Wednesday last from Bordeaux, which port he left on the 9th June, reports, that on the 8th August, he encountered in latitude 38° south and longitude 21° east (from Paris.) $23^{\circ} 20'$ E. from London ; while scudding before a tremendous sea, an awful whirlwind, which in a twinkling carried away her three sails furrowing them with flashes of light (without however either destruction or ignition,) carried away the two top-gallant masts, and shoved the ship to windward, throwing her on her beam ends to starboard, the water pouring over her bulwarks. In this perilous situation she lay for nearly half an hour, nor was she righted till she was again brought before the wind by means of a tarpaulin hung out from the fore rigging, and by cutting away the mizen mast, weather backstays, and shrouds of the main top mast, which fell, carrying along in its fall the head of the main mast. She scudded during the remainder of the gale under bare poles.”

In addition to this notice, Captain Saliz, who is a gentleman of education and long nautical experience, with great intelligence, has obligingly favoured me with his log book, and with replies to many questions addressed to him, from which I collect, in addition to what is stated above, the following particulars.

He was on the 8th August at noon in Lat. $38^{\circ} 28'$ S. Long. by Chr. $19^{\circ} 57'$ E. from Paris, $22^{\circ} 17'$ E. from London Bar. at 27.5 French (28.00 Eng.) steering to the SE. $\frac{1}{2}$ E. with wind from the North, to which it had veered from the NE. at midnight preceding. Sea heavy from NE. and at times from the NW. heavy squalls ; sea very high from

* The P. C. of the 14th contains some corrections which are made here.

Chart
to the Fifth Memoir
on
THE LAW OF STORMS
in India
Shewing the probable course
of the Madras Storm of
13th May 1841
By H. Piddington



the NE. and North and going over the bulwarks. P. M. heavy gale from the Northward, scudding under double reefed main topsail on the cap, foresail and foretopmast stay sail: obliged to carry sail on account of the cross sea, ship rolling gunwales under. At 5 wind at NNW. to NW. At 6 caught by the whirlwind, as above related. Captain Saliz who was upon deck, says, that at the moment of being taken by it every thing was in a blaze of light (no lightning is marked before on the log, and he says that there was none worth noticing) like a sort of meteor, for there was fire every where, though nothing was burnt. The fire had no electrical characters. He distinctly saw the lightning cross the main* topsail in zig-zags, when the sail disappeared. He says further that the whirlwind turned *from left to right outwards*. The vessel's head was about NE. while on her beam ends, and it was blowing so furiously, that it was impossible to look to windward. A very remarkable fact is, that while all around the horizon was a thick, dark, bank of clouds, the sky above was so perfectly clear that the stars were seen, and one star shone with such peculiar brilliancy above the head of the foremast that it was remarked by every one on board! The Barometer which, as stated, was at noon at 27.5 Fr. or 28.00 Eng. was at 6 P.M. at 27.3 Fr. 27.79 Eng., and at midnight again at 27.5 Fr. The gale after the whirlwind was at WNW. veering to the West, and remaining there till fine weather on the following day, when the American ship *Thomas Perkins* passed them with royals and studding sails set. A remarkable fact also was the warmth of the weather. Capt. Saliz did not notice the thermometer, but says that every one found it "quite warm!"

No person on board was in any way affected by the lightning. The sea after, and during, the vessel's lying over was much diminished, and was a sheet of foam. After righting she steered EbS. and ESE. with the wind.

They found, on saving the wreck of the main top mast and mainmast head, that the topmast, though the vessel was upon her beam ends, appeared to have been *lifted* out of its place instead of being wrenched over in any way! I should not omit to say here, for it is due to them, that Captain Saliz speaks in the highest terms of the spirit and courage shewn by his gallant little crew and officers in this perilous crisis.

* Some fragments were left, but these had no traces of ignition

Paragraphs to be added to Captain G. B. TREMENHEERE'S Report on the Tin of Mergui, communicated to the Asiatic Society, through the Secretariat of the General Department.

Of the existence of tin in considerable quantities there cannot, from the facts above stated, be much question ; and from the trial of the produce of one man's labour in a given time, there appears to be sufficient to justify every expectation of a profitable employment of labour on an extensive scale.

The results, however, which are given in detail, can only be considered rough approximations to the probable out-turn of tin, with an establishment properly superintended. Much economy in labour might be effected in collecting the sand and gravel for the washers, but no better mode could, I think, be adopted in separating the tin in the first instance, than by people accustomed to work with the flat conical-shaped troughs before described. The quantity collected would fully repay the employment of men in this operation.

The tin as produced by the washers, should be placed on sloping boards, and water conducted over it from a trough pierced with holes for the purpose, in order to get rid of foreign particles, and it would then, after by being finely pounded, be ready for smelting. Of all metals, tin is in this process the least troublesome after the ore is freed from the earthy and silicious particles, with which in other countries it is often mixed. The crystallized form in which the ore is here found, renders its separation extremely easy, and the whole processes of stamping and dressing, which in England are tedious and expensive operations, can thus be dispensed with. No arsenic or sulphur being mixed with the ore, it need not be roasted before it is placed in the furnace.

It will thus be seen, that the tin of the Mergui province offers no ordinary inducement to the outlay of capital without much of the risk, uncertainty, and large previous outlay usually attending mining adventures.

Extracts from a letter to Government on the above subject, from DR. M'CLELLAND, Secretary to the Coal Committee.

In reply I have the honor, under instructions of the Coal and Mineral Committee, to say, that the specimens of peroxide of tin received from the Tenasserim Provinces, are the usual ore of tin which is worked with much advantage in the Dutch possessions in the Straits, and in the lower parts of the Malay Peninsula, south of the British boundary ; but it has not hitherto been supposed to be sufficiently abundant on the Coast, to be profitably worked beyond the tenth degree of north latitude.

The importance of this ore depends entirely upon the quantity in which it occurs, the most profitable repositories are those in which it is found in the form of crystals, in soft gneiss. It is often, however, profitably obtained from the sands of rivers, when it is called stream-tin ore.

The tin occurs as stream ore in all the localities described by Captain Tremenheere, except Kahun, a hill on the right bank of the great Tenasserim, about 11 miles from Mergui, vide paragraphs 16 and 17 of Captain Tremenheere's Report. Here Captain Tremenheere found the ore in its native repository, a friable gneiss rock, similar to that in which it occurs at Banca.

The Committee are of opinion, that the circumstances brought forward by Captain Tremenheere in the 16th and 17th paragraphs of his Report, are such as to render it desirable, that the miner recently employed in Kemaon, under Captain Drummond, should, if now available, be placed under the orders of Captain Tremenheere, for the purpose of ascertaining the value of the ore at Kahun.*

* The miner (Mr. Wilkin) has, I am sorry to learn, preferred returning with the fruits of his experience in Kemaon to England to accepting this offer.—ED.

Note to the Botanico-Agricultural Account of the protected Sikh States,
No. 1, September, 1838, p. 764. By M. P. EDGEWORTH, Esq. C. S.

The plant then described as *Reseda Oligandra*, has since been published in three plates to Jacquemont's *Voyage*, t. 25, p. 234, under the name of *Oligomeris Glauscescens*.

He forms a new genus of the *Resedaceæ* of it.

The species of the *Boraginæ* described, I have since ascertained to belong to the genus *Nonnea*, stated in Endlicher to belong to Europe and Central Asia.

The name of the species of *Plantago* is *Ban-phúla*, misprinted *Bau-phula*.

The species of the *Acanthaceæ* noted as peculiar to the Jhand tract, I have never had an opportunity of examining; the only time I ever saw it, was as a large leafless cone of imbricated bracts, containing ripe seeds, which were covered with silky hair; from its habit I should judge it to be either an *Acanthus* or a *Lepidagathis*.

I subsequently found Jacquemont's *Cleome Ruta*, t. 19, p. 19, apparently a very distinct species; it is very rare near Loodihana, but becomes abundant near Ferozpoor. This last locality is peculiarly distinguished by the abundance of the *Bertholetia lanceolata*, which covers acres of ground. I was only there during the winter, and had consequently no opportunity of investigating the botany of the neighbouring country. I observed great abundance of a species of *Womismia*, which I have not found to the east of Loodihana. It is nearly, if not quite, identical with Dr. Wight's *W. Capitata* from the Peninsula. But I doubt not that in the rainy season, several curious forms might be found in the neighbourhood of Ferozpoor, especially in the extensive Jhand forest lying to the south-east.

At Loodihana in August 1839, I detected a new species of grass, which I cannot refer to any described genus of *Chlorideæ*. It approaches nearest to *Eleusine*, but wants the great characteristic of that genus the *Aril*, and the spikelets are many-flowered. I propose to call it *Ochthochloa*, from its growing only on Kheras, or Thés, the deserted sites of villages. *Οχθος tumulus*, *χλον grass*, generic character.

Spicæ digitatæ. Locustæ unilaterales sessiles, multifloræ distichæ ; flore supremo sterili.

Glumæ 2. membranaceæ persistentis, angustæ, carinatæ inæquales.

Paleæ 2. exterior membranacea mucronata, interior hyalina mutica, hodiculæ hyalinæ ovatæ.

Stam 3. styli 2. stigmata plumosa, semen ellipticum, glabrum bimucronulatum.

OCHTHOCLOA dactyloides.

Descriptio.

Repens, stolonibus longis ramosis nodisque glaberrimis (rarius articulis pilis siricui albis circumdatis) plus minus geniculatis ; foliis approximatis angustis breviusculis vaginis brevibus, basi pilis longis sparsè barbatis, ligula brevi ciliato, membranacea.

Pedunculus erectus solitarius terminalis, spicis 3-5, stellatim digitatis, post anthesin defractis, multifloris ; insertione pubescente, rachide undulato glabro asperulo.

Locusta biglumis, 7 floris cum octavo stirili.

Glumæ valde inæquales ; *exteriore* paleis quadruplo brevior obtuse truncato, margine scariosa, uninervia carina viridi, serrulata ; *superiore* paleis paulo brevior, multo angustior, uninervia, carina serrulata.

Paleæ 2 : *exteriore* majore herbacea trinervia ; purpurascens cum nervis viridibus nervo medio validiore serrulato ; apice mucronulata basi hirtella ; *superiore* subhyalina, carinis duabus eleganter ciliatis. Lodiculæ laterales, hyalinæ, ovatæ.

Stamina 3. longa exserta ; antheris pallide purpuris centibus utrinque breviter bifidis.

Ovarium turbinatum ; stylis separatis breviusculis ; stigmatibus breviter plumosis albidis exsertis.

Semen anguste ellipticum utrinque sub-acutum apice reliquiis stylo- rum bimucronulatum, rugosiusculum uno latere compressiusculum.

Habitat in Pagorum disertorum tumulis cum Capparide aphylla.

Apud pagum Jassowals prope Lodihana.

On Equations of Condition for a Quadrilateral, common or re-entrant. By Captain R. SHORTEDE, Assistant Surveyor General.

Some years ago when engaged in investigating a general method for disposing fairly of the errors which occur in observing angles, the following properties of the angles of a quadrilateral occurred to me as furnishing equations of condition proper to be used in such cases. Some of the properties were new to me at the time, but it is possible enough, most of them may have been known long ago to others.

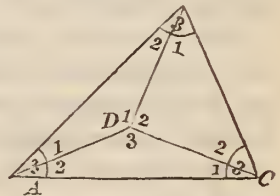
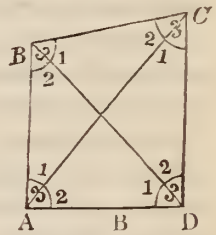
In the quadrilateral A B C D with its diagonals, for the sake of conciseness and uniformity, let A denote the angle B A C, A_2 the angle C A D, and A_3 the angle B A C; and similarly for the other angles, those on the left hand side having 1, as their distinctive mark; those on the right hand having 2, the whole angle of the figure being distinguished by 3.

When the quadrilateral becomes re-entrant as in the 2d figure, a similar notation is used as in the margin.

There are two classes of these equations of condition, of which, one, depending entirely on the summation of the angles, may be termed the class of *angular* equations: the other depending on the products of the sines of the angles taken in a certain order may be termed *sinal** equations.

In the first figure we have the following angular equation :—

$$(A) \quad \left. \begin{array}{l} A_1 + A_2 = A_3 \\ B_1 + B_2 = B_3 \\ C_1 + C_2 = C_3 \\ D_1 + D_2 = D_3 \end{array} \right\} \begin{array}{l} \text{These may be termed} \dagger \text{ Totopartial equations.} \\ \dagger \text{ These are not peculiar to figure or to space, but} \\ \text{are expressions for a universal property, common to} \\ \text{all sorts of quantity.} \end{array}$$



* This word I prefer to Sinical, which, though formerly used, is now nearly obsolete: it has the advantage of being shorter, besides, not being liable to be mistaken for another word of similar sound, but of totally different meaning. Moreover the word sine being of apocryphal origin, we need not, for the sake of a fancied analogy, bind ourselves to the use of an inconvenient term

$$(B) \left. \begin{aligned} A_1 + B_3 + C_2 - 180 &= \varepsilon_1 \\ B_1 + C_3 + D_2 - 180 &= \varepsilon_2 \\ C_1 + D_3 + A_2 - 180 &= \varepsilon_3 \\ D_1 + A_3 + B_2 - 180 &= \varepsilon_4 \end{aligned} \right\} \begin{array}{l} \text{These may be termed Trian-} \\ \text{gular equations.} \end{array}$$

(C) $A_3 + B_3 + C_3 + D_3 - 360 = \varepsilon_1 + \varepsilon_3 = \varepsilon_2 + \varepsilon_4$. This may be termed the Quadrangular equation.

In the Triangular equations substitute for the middle angle its totopartial value as above, and subtract each expression from the one immediately above it, and we have

$$(D) \left. \begin{aligned} A_1 + B_2 - C_1 - D_2 &= \varepsilon_1 - \varepsilon_2 = \varepsilon_4 - \varepsilon_3 \\ B_1 + C_2 - D_1 - A_2 &= \varepsilon_2 - \varepsilon_3 = \varepsilon_1 - \varepsilon_4 \end{aligned} \right\} \begin{array}{l} \text{These may be} \\ \text{termed Vertical} \\ \text{equations.} \end{array}$$

In like manner in the 2d figure we have

$$(a) \left. \begin{aligned} A_1 + A_2 &= A_3 \\ B_1 + B_2 &= B_3 \\ C_1 + C_2 &= C_3 \\ D_1 + D_2 + D_3 &= 316 \end{aligned} \right\} \begin{array}{l} \text{Totopartial equations.} \end{array}$$

$$(\beta) \left. \begin{aligned} A_1 + B_2 + D_1 - 180 &= \varepsilon_1 \\ B_1 + C_2 + D_2 - 180 &= \varepsilon_2 \\ C_1 + A_2 + D_3 - 180 &= \varepsilon_3 \\ A_3 + B_3 + C_3 - 180 &= \varepsilon_1 + \varepsilon_2 + \varepsilon_3 \end{aligned} \right\} \begin{array}{l} \text{Triangular equations.} \end{array}$$

Also $D_1 = 360 - D_2 - D_3$ and substituting the values of D_2 and D_3 from the triangular equations

$$\begin{aligned} &= 360 + B_1 + C_2 - 180 - \varepsilon_2 + C_1 + A_2 - 180 - \varepsilon_3 \\ &= B_1 + C_3 + A_2 - \varepsilon_2 - \varepsilon_3 \end{aligned}$$

$$(\delta) \left. \begin{aligned} \therefore B_1 + C_3 + A_2 - D_1 &= \varepsilon_2 + \varepsilon_3 \\ C_1 + A_3 + B_2 - D_2 &= \varepsilon_3 + \varepsilon_1 \\ A_1 + B_3 + C_2 - D_3 &= \varepsilon_1 + \varepsilon_2 \end{aligned} \right\} \begin{array}{l} \text{These may be term-} \\ \text{ed Cuneal equations,} \\ \text{from the wedge shape} \\ \text{of the angles concerned.} \end{array}$$

If we examine in detail, these angular equations, we shall find that in both cases, besides the totopartial equations, there are two separate equations of condition, whereby to determine the error on each of the 12 angles in the figure. As these, with the exception perhaps of the Vertical and Cuneal equations contain nothing new, I shall proceed to the investigation of the sinal equations, which indeed is the main object of the present communication. These I shall give in the form, in which they first occurred to me.

Prop. I.—In a quadrilateral the product of the sine of any whole

angle, and the sines of the two consecutive left hand angles going round by the left, is equal to the product of the sine of the opposite whole angle, and the sines of the two corresponding right hand angles returning by the right.

$$(E) \quad \begin{array}{l} \sin A_3 \sin B_1 \sin C_1 = \sin C_3 \sin B_2 \sin A_2 \\ \sin B_3 \sin C_1 \sin D_1 = \sin D_3 \sin C_2 \sin B_2 \\ \sin C_3 \sin D_1 \sin A_1 = \sin A_3 \sin D_2 \sin C_2 \\ \sin D_3 \sin A_1 \sin B_1 = \sin B_3 \sin A_2 \sin D_2 \end{array} \left. \begin{array}{l} \text{These (for rea-} \\ \text{sons afterwards} \\ \text{to be shewn) may} \\ \text{be termed exter-} \\ \text{nal alternate equations.} \end{array} \right\}$$

Prop. II.—In a quadrilateral, the continued product of the sines of two adjacent whole angles, and the sines of the angles between the diagonals, and the opposite sides, is equal to the continued product of the two pairs of opposite angles.

$$(F) \quad \begin{array}{l} \sin A_3 \sin B_3 \sin C_1 \sin D_2 = \sin C_3 \sin D_3 \sin A_1 \sin B_2 \\ \sin B_3 \sin C_3 \sin D_1 \sin A_2 = \sin D_3 \sin A_3 \sin B_1 \sin C_2 \end{array} \left. \right\}$$

These may be termed opposite alternate equations.

Also the known property, that the product of the sines of all the left hand angles is equal to that of the sines of all the right hand angles.

(G) $\sin A_1 \sin B_1 \sin C_1 \sin D_1 = \sin A_2 \sin B_2 \sin C_2 \sin D_2$ which may be termed the internal alternate equation.

Demonstration.

$$B D = C D \frac{\sin C_3}{\sin B_1} \text{ by common Trigonometry,}$$

$$\text{also } A D = C D \frac{\sin C_1}{\sin A_2} = B D \frac{\sin B_2}{\sin A_3} = C D \frac{\sin C_3 \cdot \sin B_2}{\sin B_1 \sin A_3}$$

$$\frac{\sin C_1}{\sin A_2} = \frac{\sin C_3 \cdot \sin B_2}{\sin B_1 \sin A_3}$$

$$\therefore \sin A_3 \sin B_1 \sin C_1 = \sin C_3 \sin B_2 \sin A_2 \dots \dots \dots (e)$$

$$\text{Again } B D = A D \frac{\sin A_3}{\sin B_2} = B C \frac{\sin C_3}{\sin D_2}$$

$$A C = B C \frac{\sin B_3}{\sin A_1} = A D \frac{\sin D_3}{\sin C_1}$$

$$\text{and multiplying vertically, } \frac{\sin A_3 \cdot \sin B_3}{\sin B_2 \sin A_1} = \frac{\sin C_3 \cdot \sin D_3}{\sin D_2 \sin C_1}$$

$$\therefore \sin A_3 \cdot \sin B_3 \cdot \sin C_1 \cdot \sin D_2 = \sin C_3 \cdot \sin D_3 \cdot \sin A_1 \sin B_2 \quad (f)$$

This result might have been deduced from (E), by dividing any of the equations by another *as they stand*: thus:—

$$\frac{\sin B_3 \cdot \sin C_1 \cdot \sin D_1}{\sin C_3 \cdot \sin D_1 \cdot \sin A_1} = \frac{\sin D_3 \cdot \sin C_2 \cdot \sin B_2}{\sin A_3 \cdot \sin D_2 \cdot \sin C_2} \text{ and rejecting common factors.}$$

$$\frac{\sin B_3 \sin C_1}{\sin C_3 \sin A_1} = \frac{\sin D_3 \sin B_2}{\sin A_3 \sin D_2}$$

$$\therefore \sin A_3 \cdot \sin B_3 \cdot \sin C_1 \cdot \sin D_2 = \sin C_3 \cdot \sin D_3 \cdot \sin A_1 \cdot \sin B_2$$

Again multiplying vertically all the equations, (E) rejecting common factors, and taking the square root, we have

$$\sin A_1 \cdot \sin B_1 \cdot \sin C_1 \sin D_1 = \sin A_2 \cdot \sin B_2 \cdot \sin C_2 \cdot \sin D_2 \text{ ..(g)}$$

In like manner in the 2d figure we have the following equations:

$$\begin{aligned} & \sin A_3 \cdot \sin B_1 \cdot \sin D_3 = \sin B_3 \cdot \sin A_2 \cdot \sin D_2 \\ \text{(H)} \quad & \sin B_3 \cdot \sin C_1 \cdot \sin D_1 = \sin C_3 \cdot \sin B_2 \cdot \sin D_3 \\ & \sin C_3 \cdot \sin A_1 \cdot \sin D_2 = \sin A_3 \cdot \sin C_2 \cdot \sin D_1 \end{aligned} \left. \begin{array}{l} \text{Which may} \\ \text{be termed} \\ \text{external al-} \\ \text{ternate.} \end{array} \right\}$$

Also

$$\sin A_3 \cdot \sin B_1 \cdot \sin C_1 \cdot \sin D_1 = \sin C_3 \cdot \sin B_2 \cdot \sin A_2 \cdot \sin D_2$$

$$\text{(I)} \quad \sin B_3 \cdot \sin C_1 \cdot \sin A_1 \cdot \sin D_2 = \sin A_3 \cdot \sin C_2 \cdot \sin B_2 \cdot \sin D_3$$

$$\sin C_3 \cdot \sin A_1 \cdot \sin B_1 \cdot \sin D_3 = \sin B_3 \cdot \sin A_2 \cdot \sin C_2 \cdot \sin D_1$$

which may be termed medial alternate.

And

(K) $\sin A_1 \cdot \sin B_1 \cdot \sin C_1 = \sin A_2 \cdot \sin B_2 \cdot \sin C_2$ which may be termed internal alternate.

Demonstration.

$$C D = A C \frac{\sin A_2}{\sin D_3}$$

$$B C = A C \frac{\sin A_3}{\sin B_3} = C D \frac{\sin D_2}{\sin \sin B_1} A C \frac{\sin A_2}{\sin D_2} \cdot \frac{\sin D_3}{\sin B_1}$$

$$\frac{\sin A_3}{\sin B_3} = \frac{\sin A_2}{\sin D_3} = \frac{\sin D_2}{\sin B_1}$$

$$\therefore \sin A_3 \sin B_1 \sin D_3 = \sin B_3 \sin A_2 \sin D_2 \dots\dots\dots (h)$$

Multiplying vertically pairs of (H), and rejecting common factors, we have the equations,..... (i)

and multiplying vertically the whole of (H) in like manner, we have the equation,..... (k)

I found at first some difficulty in trying to express in a convenient form of words, the properties in the equations (H) and (I); but after

some consideration it appeared that they were included in the expressions for (E) and (F) : for if the point D in fig. I. be conceived to move along the line B D till it comes within the line A C, the quadrilateral with its diagonals is transformed into the triangle with its radial lines. The figure may now be considered as a quadrilateral with a reentrant angle, in which case the angles A_1 and A_3 exchange their designations, A_2 remaining unchanged.

The analogy of these figures may be otherwise apprehended by considering them as the perspective representations of a tetrahedron ; which is a quadrilateral with its diagonals, when the apex is projected between the exterior angles of the base ; and is a triangle with its radial lines, when the apex is projected within the base, or within the vertical angles formed by the sides of the base produced.

These equations hold good in spherical as well as in plain figures, the only change in the demonstration being to substitute the sines of the spherical sides for the plane's sides as above.

The equations marked (G) and (K) are obviously only particular cases of a more general property given by W. Davies in his Supplement to the spherical part of Young's Trigonometry, and there said to be due to Professor Lowry. Lowry's Theorem is this: "*If great circles be drawn from the angular points of any spherical polygon to a point on the surface of the sphere, the product of the sines of the alternate angles will be equal.*" This theorem applies of course in plane as well as in spherical polygons, and it is not unlikely, that if we substitute lines of shortest distance (including at once both straight lines and great circles), it may be found to apply on a spheroidal, as well as on a spherical or a plane surface.

On farther consideration I find that the equations (E) and (H) are also included in Lowry's theorem. In fig. I. D being the point to which lines of shortest distance are drawn from the angles of the polygon A B C Lowry's theorem gives at once the first of the equations (E) and taking successively the points A B and C in like manner, the other equations are evolved.

Likewise on fig. 2 if C be the point to which the lines are drawn from the angles of the polygon A B D, we have the first of the equations (H) and the others by taking successively A and B as the point of drawing to (i. e. *attraction* in its primary sense).

The sinal equations furnish in each case four equations of condition for

each of the 12 angles concerned. I do not see how any of them can fairly be omitted; for although any one of them may involve all the others *when the angles are free from error*, such is not necessarily the case when the angles, *as happens in fact*, are mixed up with errors we know not how. I know not of any way by which a fair judgment can be formed as to the goodness or badness of observations, besides that resulting from the amount of minimum alteration required to make the whole consistent among themselves. It is quite possible, and will generally happen, that in every one of the above equations taken singly, the errors will be so mixed up in two or more of the quantities concerned as in a greater or less degree to destroy the effect of each, which errors will become sufficiently apparent when the quantities are otherwise combined. Using the whole of the equations, if the correction for any one quantity retains the same signs throughout, while on another quantity the correction is in a great measure destroyed, being sometimes + and sometimes —, we may fairly infer that in the former case the observed quantity is erroneous, and in the latter that it approaches to its true value; the errors being in proportion to the algebraic sum of all the corrections.

The sinal and angular equations of figure being quite independent of each other, I am not aware of any reason for preferring the one set of them to the other; it appears to me that both ought to be taken into account simultaneously, giving equal weight to the mean error as found from each set. By any other method, the ultimate corrections will depend on the arbitrary order, in which the equations may have been applied. It may, however, be expedient to apply the totopartial equations, which are independent of figure, after having taken the mean of the others.

The practical use of these equations in the method above sketched, when we retain only what is necessary, though still somewhat long, is by no means very difficult. The most convenient way would be to take the sums of the effective probabilities, and the sums of the errors, and get the correction by common Rule of Three, by the help of a sliding rule.

Writers on the doctrine of probabilities direct that when several independent quantities occur, they should be combined according to their weights, or inversely as their probabilities of error, as found by the common rule. This applied to each of the above equations would give rise

to very lengthy calculations. But though the common rule for finding the probability of error on a number of observations be as good as, or perhaps better than, any other at present known, I think it may be shewn that after all it has only a chance of being right, and is far from certainty in all cases. It may be a pretty good approximation when the number of observations is great, but when the number is small it seems somewhat dubious; at least, when the number is a minimum it is palpably false, and it is not likely that it should become false *per saltum*.

The rule commonly given, is to take the arithmetical mean of all the observations, and the difference between this and each observation; then squaring each of these differences, take the square root of their sum; which root divided by the number of observations gives the probability of error; the reciprocal of which gives the proportional weight due to each.

I have long sought, but never met with, a demonstration of this rule. According to it, however great be the number of observations, if they differ among themselves by any quantity, however small, there will be a probability, however small, of error; and therefore the result must fall short of certainty. But if there be any number of observations agreeing among themselves, or even only one observation, there is no probability of error: so at least says the rule, whereas common sense says in the latter case the probability of error is very great, though we have no means of making a better of it.

Hence I hold that the rule commonly given for finding the probability of error on a set of observations, though in general a pretty good practical rule, is *not a mathematical truth*: and I would not, on the faith of its being such, build a cumbrous computation to obtain a result not much, if at all better than that which may be obtained with one-tenth part of the labor: for such I believe would be the disproportion between the combination of these equations according to the method above indicated, and that by their weights as directed by writers on probabilities.

As to the practical difference in the results by these two methods of adjustment, I cannot speak from actual trial; but I believe it would rarely exceed one or two hundredths of a second; and if we recollect that it is amazingly difficult with ordinary, or even with extraordinary instruments, to observe to within ten times the greatest of these quan-

tities; and also that making adjustments by the sinal equations by means of Tables as in the final calculations to seven places of decimals, the difference of a single unit in the last place of a logarithmic sine corresponds at 45° to an angular difference of $\frac{1}{21}$, "or about five hundredths of a second; and at 60° to $\frac{1}{12}$, or about eight hundredths of a second; moreover, it is well known that in adding together several logarithms each of which is only approximately true in the last place, there can be no certainty that the sum will be true within one or two units in the last place; therefore the difference between the two methods of adjustment, (if I do not greatly err in estimating it,) may be considered as of no practical importance, being beyond the reach of the Tables.

In regard to the exceedingly minute quantities which some of the continental observers used to profess themselves able to determine by means of the repeating circle, there is a very sensible remark by old Troughton, in a paper of the Astronomical Society, the substance of which I quote from memory, to the effect that whatever be the ability of the observer, or the construction of his instrument, he never would believe in the quantities deduced beyond such as were visible in the telescope. In fact, so long as observations have error at all, dispose of that error how we may, we cannot get rid of it so as to ensure certainty; the only advantage which the arrangement ultimately adopted can possess is, that of being a little better than a number of other arrangements equally possible, each of which is only somewhat less probable.

N. B.—In the equations (B) (C) (β) (δ) the characters $\epsilon_1, \epsilon_2, \epsilon_3, \epsilon_4$, denote the excess on the respective triangles.

SPHEROIDAL EXCESS.

To find an expression for the Excess on a Spheroidal Triangle. By Captain SHORTEDE, 1st Assistant Grand Trigonometrical Survey.

It has been usual to consider the excess on a spheroidal as not differing sensibly from that on a spherical triangle of the same area as estimated by the mean radius of the earth, and this may generally be considered sufficient, for in the largest triangle ever observed, the

difference is not a matter of observation. But as the two triangles have not absolutely the same excess, it may be worth while to ascertain the precise value of each, and thereby what would be the difference in any particular case.

A solution may be obtained by means of the following principle given by Mr. Airey as resulting from Dalby's investigation, namely, that the excess on a spheroidal is the same as on a spherical triangle whose angular points have the same geographical latitudes and longitudes.

The arcs being small, (as is always the case in practice), it is an assumption generally made and admitted, that the computations may be made by means of the radii of curvature at their middle points, which comes to the same thing as to reckon longitudes by a normal equal to the mean of all the normals at the middle points of the three sides, and latitudes by a radius of curvature equal to the mean of the meridional radii of curvature at the same points: or simply or at once, by the normal and meridional radius of curvature at the centre of gravity* of the triangle. The surface of the spheroidal triangle would coincide with that on a sphere if the differences of latitude were stretched out in the ratio of the meridional radius to the normal, or if the longitudinal differences were contracted in the inverse ratio. Hence the area, and also the excess on a spheroidal triangle would coincide with those on a sphere, if they be computed by a radius equal to a mean proportional between the normal and meridional radius (*i. e.* the greatest and least radii of curvature), at the middle of the triangle. This method (which is probably the simplest possible), is true as far at least as quantities of the 4th order, and in the present as well as prospective state of the arts and sciences, any thing farther may be thought an unnecessary refinement.

If r denote the radius of the sphere, and A the area of a spherical triangle, the expression for the excess E reduced to its simplest form is

$$E = \frac{A}{r^2} \text{ in terms of radius unity, or in seconds } E'' = \frac{A}{r^2 \sin 1''}, \text{ and}$$

if the area be assumed as equal to that of a plane triangle having the same sides a , b , and contained angle C , the formula becomes

* This expression may be objected to, as strictly the centre of gravity falls within the surface. It may be understood as an abbreviated expression, denoting the point of intersection of lines drawn from the angular points to bisect the opposite sides.

$E'' = \frac{a b \sin C}{2 r^2 \sin 1''}$; in which the denominator being constant, and the quantities in the numerator those which occur in the calculation of the triangle, the calculation of the excess becomes as simple as need be.

To adapt this to the case of a spheroidal triangle, all that is necessary is to substitute for r^2 the expressions for the normal and meridional radius of curvature. Assuming a and β to denote the polar and equatorial radii, and $\epsilon = \frac{\beta^2 - a^2}{a^2}$, and λ the latitude, the expression for

the normal is $\nu = \frac{a(1 + \epsilon^2)}{(1 + \epsilon^2 \cos^2 \lambda)^{\frac{1}{2}}}$, and for the meridional radius

$\gamma = \frac{a(1 + \epsilon^2)}{(1 + \epsilon^2 \cos^2 \lambda)^{\frac{3}{2}}}$; hence the product of the two $\gamma \nu = \frac{a^2(1 + \epsilon^2)^2}{1 + \epsilon^2 \cos^2 \lambda}$

and this substituted for r^2 gives the excess on a spheroidal triangle.

$$\begin{aligned} E'' &= \frac{a b \sin C}{2 a^2 \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{(1 + \epsilon^2)^2} = \frac{a b \sin C}{2 \beta^2 \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{1 + \epsilon^2} \\ &= \frac{a b \sin C}{2 a \beta \sin 1''} \frac{(1 + \epsilon^2 \cos^2 \lambda)^2}{(1 + \epsilon^2)^{\frac{3}{2}}} = \frac{a b \sin C}{2 a \beta \sin 1''} \frac{1 + 2 \epsilon^2 \cos^2 \lambda}{1 + \frac{3}{2} \epsilon^2} \end{aligned}$$

Of the above expressions, the first three are identical and rigorous. The last is an approximation got by actually performing the operations indicated in that preceding it. It is however, sufficiently close for any ordinary purpose, as the quantities omitted affect only the 7th place of decimals. It appears from it that, when $2 \cos^2 \lambda = \frac{3}{2}$, or $\cos^2 \lambda = \frac{3}{4}$, that is, in latitude 30° , the excess on the spheroidal triangle coincides with that computed by the mean radius. In lower latitudes the spheroidal excess is greater than the spherical, and only in latitudes higher than 30 is it less than on the sphere.

To render this formula practically useful I have computed in the following Table the value of the logarithm of $\frac{1}{2} \frac{1}{\gamma \nu \sin 1''}$ or $\frac{R''}{2 \gamma \nu}$ for every degree of latitude. I have assumed the values of the polar and equatorial radii of the earth as deduced from the comparison of the whole European with the Indian arc, as far as Kahanpur in latitude $24^\circ 07'$, adapted to a ratio of axes 299 to 300.

SPHEROIDAL EXCESS.

Latitudinal Factors for computing Spheroidal Excess.

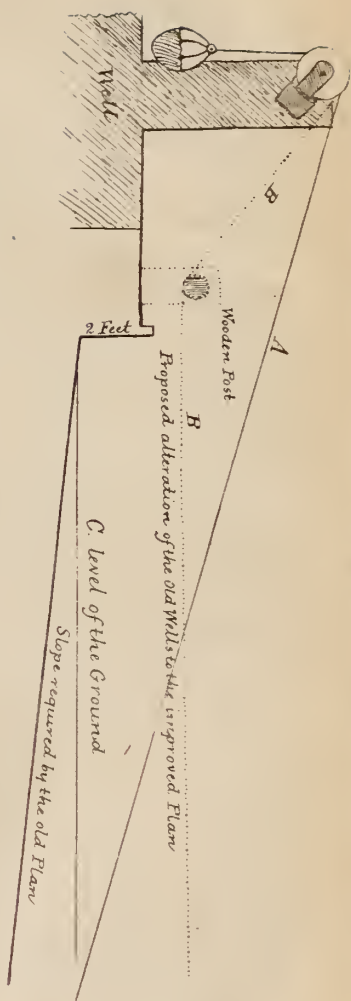
Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.	Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.	Lat.	Log. $\frac{R''}{2\gamma\nu}$	Diff.
0	0.37505	1	30	0.37360	8	60	0.37071	8
1	504	0	31	352	9	61	063	9
2	504	1	32	343	9	62	054	8
3	503	1	33	334	10	63	046	8
4	502	2	34	324	9	64	038	8
5	0.37500	2	35	0.37315	10	65	0.37030	8
6	498	2	36	305	9	66	022	7
7	496	3	37	296	10	67	015	7
8	493	3	38	286	10	68	008	7
9	490	3	39	276	10	69	001	7
10	0.37487	3	40	0.37266	10	70	0.36994	6
11	484	4	41	256	10	71	988	6
12	480	5	42	246	10	72	982	6
13	475	4	43	236	10	73	976	5
14	471	5	44	226	10	74	971	6
15	0.37466	5	45	0.37216	10	75	0.36965	5
16	461	6	46	206	10	76	960	4
17	455	5	47	196	10	77	956	4
18	450	6	48	186	10	78	952	4
19	444	7	49	176	10	79	948	4
20	0.37437	6	50	0.37166	10	80	0.36944	3
21	431	7	51	156	10	81	941	3
22	424	7	52	146	10	82	938	3
23	417	8	53	136	9	83	935	2
24	409	7	54	127	10	84	933	2
25	0.37402	8	55	0.37117	9	85	0.36931	2
26	394	8	56	108	10	86	929	1
27	386	8	57	098	9	87	928	1
28	378	9	58	089	9	88	927	0
29	369	9	59	080	9	89	927	0
30	0.37360		60	0.37071		90	0.36927	

As an example, suppose it were required to find the excess on a triangle having its middle point in latitude 24° , the sides a and b being 40 and 50 miles, and the contained angle $C = 65^\circ$, the logarithms of a and b in feet being 5.3246939 and 5.5007852, the calculation would stand thus :—

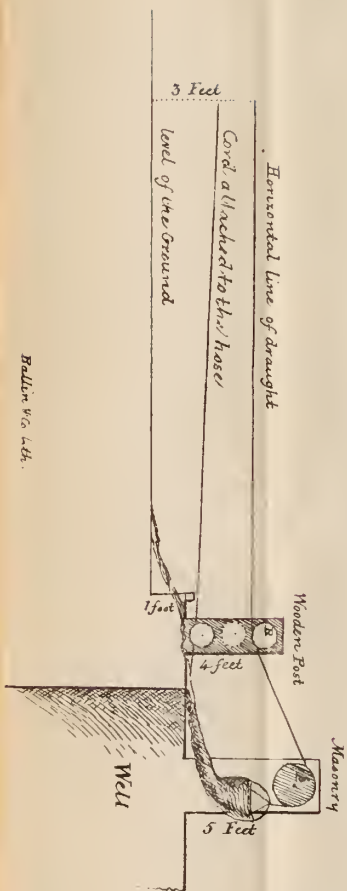
Tab Long for 24° ,	0.37409
Long. Sin $C = 65^\circ$,	...	...	...	...	9.55728
Long. a,	...	...	...	...	5.32469
Long. b,	...	...	...	...	5.50079
Long. $E = 5.77128$,	...	...	...	...	0.75685

It is of no great importance to know the latitude of the middle of the triangle much within a degree, because the difference of the tabular logarithms for a degree never exceeds unit in the 4th place, which will scarcely ever give any sensible difference on the resulting excess.

It will hereafter be shewn, that the error arising from assuming the area as equal to that of a plane triangle having the same sides and contained angle, is utterly insensible.



Improved Plan



On Improvement in Irrigation

*An improvement in Irrigation. By Lieut. A. MURRAY MCGREGOR,
66th Regiment Native Infantry.*

My principle is, that the greatest power is obtained by keeping the line of draught horizontal, and at the height of the animal's shoulder as is shewn by the mode in which the gigs used in trotting matches are built. This plan was tried at Cawnpoor, by Mr. Stubbs, provisioner, and he assured me, that he drew one-third more water by my method, than he had upon the old principle; and that the cattle were less distressed than by the old mode, as it is more laborious to walk up an ascent than upon level ground; and he had three more wells prepared upon my principle, as it was by far less expensive, and the ground formerly lost by the inclined plane was saved to the garden, by adapting the hose, (which I do not claim as MY invention.) One man will do all the work, and a pair of bullocks will draw the water required in two-thirds of the time required formerly; and the expence is much less. The rope passes over the block or wheel A, and under that at B, by which great power is obtained.

By the common plan in use the excavate ground becomes at once a dead loss, and the labour of walking up the inclined plane is very great, as it is required to be very steep. I have therefore, by the dotted line B, shewn how the alteration of the present system can be made. It will be requisite, however, to fill up the slope of the inclined plane to the level of the ground as marked at C, but that can easily be done: it would not cost more than three or four rupees.

N. B.—On the old principle, the driver is obliged to sit on the rope, to keep the yoke on the bullock's necks.

The accompanying are two very compendious Logarithmic Tables, in which I have endeavoured to combine the minimum of size, with the maximum of utility.—By Capt. SHORTREDE.

The mode of using these Tables is so similar to that of the Tables in common use, that it is almost needless to give any particular directions on the subject.

It is to be understood that every number in the body of each Table is supposed to consist of 5 figures; the single figure on the left in columns 0 and 5 being common to the succeeding columns on the same and following lines. These leading figures increase progressively by unity, and nine changes occur in each Table. To mark this change, when it occurs any where not at the beginning of a line, the numbers subsequent to the change are put a little lower than their usual place, in order to indicate that their first figure is to be supplied from that on the lower line, besides which, the first following zero is printed black to distinguish it as a change figure.

The Table of common Logarithms (neglecting at present those beyond 1000) has in its first column marked Nat. Num. the natural numbers from 10 to 100, and immediately adjoining in the column headed 0 are the corresponding Logarithms, (for numbers between 1 and 10, the Logarithms are opposite the tenfold number): for numbers for three figures the two first being found in the first column, the 3rd is to be found among those at the top, and in the body of the Table is seen the corresponding Logarithm. For numbers of more than 3 figures the Logarithm is found by adding to that in the Table the proportional part for the 4th and subsequent figures, (allowing, *if need be*, for the difference between the proportional part in that and the next line according to the distance of the 3rd and following figures from the middle of the line.)

Example.

Required the Log. of 33952. for 339 the Table gives, .. 53020 for 5 Propl. part gives, 65 for 2 Propl. part gives, 2.6	The 3d and subsequent figures of 33952 being about midway between 3345 and 3445, the pro- portional parts should be the half of those given in lines 33 and 34. Instead of 65, the proportional
<hr/> Log. Required, 53087.6	

The inverse use is not so convenient.
 Given Log. 53087 Reqd. Num.
 Tab. Log. next less 53020 N.N. 339

67

Prl.pt.(corrd.) next less 64 5

3

2.6 2

Number Reqd. 33952

part should be 64, being the mean of 65 and 63 : which would agree better with the result given by the larger Tables.

The Antilogarithmic Table contains the numbers to a series of Logarithms from 0 to 999. The first column contains the two first figures of the Logarithm, the third being found at the top of the columns ; and in the body of the Table is found the corresponding natural number. When the Logarithm consists of more than 3 figures, the proportional part for the 4th and subsequent figures, taken in the same line, are to be added to the number given in the body of the Table.

[The proportional parts being given for the mean difference at the middle of the line, may be adjusted, if need be, to their proper value, by allowing at sight for the difference between their value in that and the next line, according to the distance of the 3rd and following figures from 45 the middle of the line.]

Example.

Required the Number to Log. 71572.
 For Log. 715 the Table gives, 60954
 for 7 Propl. part is 98
 for 2 Propl. part is 2.8

Here the 3rd and subsequent figures being close to the middle of the line need no correction.

61054.8

Inversely Required the Logarithm to Number 61055.

Given Number 61055

Table Number next less . . 60954

The Logarithm is 715

Difference 101

For difference next less. 98

Proportional part is 7

3

For difference next less. 2.8

Proportional part is 2

Log. Required, 71572

Lalande's tables to 10,000 occupy no less than 110 pages, 18mo. and part of the 111th page. Mr. Bailey has given, in his astronomical tables, a table of Logarithms to 1000 contained on 3 pages, 4to. but only to 4 places of decimals; and subsequently he has given, as being more convenient for ordinary use, an Antilogarithmic table, of the same size and extent as the former, and besides these I am not aware of any smaller hitherto published.*

Having occasion some years ago to lay off the divisions on some sliding rules, I felt it was desirable to have at one view a table of Logarithms to 1000, that I might avoid the inconvenience of turning leaves with a beam compass in hand: I therefore wrote out the body of the first table nearly in its present form. It was immediately evident that if furnished with differences and proportional parts, the table would serve for most common purposes: accordingly the difference between the numbers in columns 4 and 5 having been written, the decimal parts were got by means of a sliding rule, with no more labour than writing them off.

The extension of the table beyond 1000 was partly to fill up the blank space, and also to avoid partly the inconvenience of the unequal differences at the beginning of the table. I found, however, that as it stood, even when the differences were most unequal, by attending to the *actual* difference between the columns, and allowing a proportional part for the difference between that and the difference here given, (and still more easily by allowing at sight for the difference between the proportional part on that and the next line according to the distance from the middle of the line,) I could get a result true, generally, within one, and always within two units in the last figure; and the same more conveniently by taking the proportional part of the actual difference by means of a sliding rule, which when engaged in calculation, I like to have always within reach.

The second table was made for the purpose of finding the number to a given Logarithm more readily than can be done by the other table. It has also the advantage of having more equal common differences. The utility of it for all ordinary purposes has been experienced by others besides myself.

* Dr. Maclear, for the use of the Cape Observatory, has remodelled Mr. Bailey's 2d Table, and printed it on two foolscap pages, with proportional parts, in a form not unlike that here given.

Each table may be made to do all that can be done by the other, but not with equal convenience. The first table giving at sight the logarithm to a number of 3 figures, and the second giving at sight the number to a logarithm of 3 figures, the proportional parts for the 4th, and subsequent figures are additive : but if a number to a given logarithm be sought by means of the first table, or if the logarithm to a given number be sought by means of the second, one subtraction is required for each figure in the proportional part : and subtraction, though a simple operation, is by no means so short or so easy as addition, and hence the advantage of using both tables instead of either exclusively.

Great care has been taken to make these tables correct in every case to the nearest unit in the last figure. The first table was taken from Lalande, whose tables are known to be correct, and has been rigidly compared in every figure. The second table was made by means of the common table in Callet, and after having been written out, it was examined by reading out the number to every logarithm, using Babbage's tables. When it was uncertain in this way whether the number was more or less than 5 in the 6th place, it has been determined by a calculation carried to ten figures.

For finding the common differences and proportional parts the following method was used. Having determined to give these for the middle between columns 4 and 5 of each table, those for the first table were thus found. M denoting as usual the common modulus, and N the number in the first column of the Table, the common difference has been taken by the formula $\frac{M}{M+4.5}$; and the proportional parts by its decimal products, taking care to make each true to the nearest unit in the 5th place of decimals.

For the second table the principal was the same, but the process vastly simpler. By the common differential formula $d \log N = \frac{M d N}{N}$; (the same as that used above) ; from this we have $d N = N \cdot \frac{d \log N}{M}$: in which M and $d \log N$. being constant, the only variable is N , and by the nature of the Table $\log N$. in each successive line increases by unit in its 2nd figure. Hence the logarithm of $d N$ being calculated for any one line, it is found for each succeeding line by adding one to its 2nd digit, and the common difference, or the number corresponding to this calculated logarithm being found more or less nearly in some column in

the body of the table, the successive differences will be found in the corresponding part of the same vertical columns throughout the table. The *proportional parts* are found exactly in the same way ; and thus, for finding the whole of the common differences and proportional parts, only ten calculations are needed ; the remaining labour being merely to transcribe from the columns in the body of the table, taking care to keep the numbers always true in the last figure.

The whole of the differences and proportional parts, after being written in, have been carefully re-examined, and I hope it will be found that these precautions have not been misapplied, so as to have failed as to the object intended.

These tables are of the minimum size, at least I do not see the possibility of making them any smaller without rendering them useless. Lalande “ after 50 years’ experience,” at page 6, of the preface to his Tables, makes the following remarks on the advantage of smallness :—

“ La plupart des calculs n'exigent que les minutes : les astronomes, les navigateurs, les militaires, les géographes, les arpenteurs, les architectes, ont un besoin continuel de petites tables, bien plus rarement des grandes. Si l'on cherche les minutes dans un gros volume qui contient les secondes, on perd du tems. Le format de celui-ci n'exige rigoureusement que le tems nécessaire à l'opération : d'ailleurs les vues basses ont de la peine avec les grandes tables ; enfin plus le volume est mince, plus il est commode à l'usage ordinaire. Ainsi j'ai réduit celui-ci au pur nécessaire.”

Natural Number.	Common Logarithms of Natural Numbers.										Common Difference.	Proportional Parts.									
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
10	00000	0432	0860	1284	1703	2119	2531	2938	3342	3743	416	42	83	125	166	208	249	291	332	374	
11	4139	4532	4922	5308	5690	6070	6446	6819	7188	7555	379	38	76	114	152	190	228	265	303	341	
12	7918	8279	8636	8991	9342	9691	0037	0380	0721	1059	349	35	70	105	140	174	209	243	279	314	
13	11394	1727	2057	2385	2710	3033	3354	3672	3988	4301	323	32	65	97	129	161	194	226	258	291	
14	4613	4922	5229	5534	5836	6137	6435	6732	7026	7319	301	30	60	90	120	150	180	210	240	270	
15	7609	7898	8184	8469	8752	9033	9312	9590	9866	0140	281	28	56	84	112	141	169	197	225	253	
16	20412	0683	0952	1219	1484	21748	2011	2272	2531	2789	264	26	53	79	106	132	158	185	211	238	
17	3045	3300	3553	3805	4055	4304	4551	4797	5042	5285	249	25	50	75	100	124	149	174	199	224	
18	5527	5768	6007	6245	6482	6717	6951	7184	7416	7646	235	23	47	71	94	118	141	165	188	212	
19	7875	8103	8330	8556	8780	9003	9226	9447	9667	9885	223	22	45	67	89	112	134	156	179	201	
20	30103	0320	0535	0750	0963	31175	1367	1597	1806	2015	212	21	42	64	85	106	127	149	170	191	
21	2222	2423	2634	2838	3041	3244	3445	3646	3846	4044	202	20	40	61	81	101	121	142	162	182	
22	4242	4439	4635	4830	5025	5218	5411	5603	5793	5984	193	19	39	58	77	97	116	135	155	174	
23	6173	6361	6549	6736	6922	7107	7291	7475	7658	7840	185	19	37	56	74	93	111	130	148	167	
24	8021	8202	8382	8561	8739	8917	9094	9270	9445	9620	178	18	36	53	71	89	107	124	142	160	
25	9794	9967	0140	0312	0483	40654	0824	0993	1162	1330	171	17	34	51	68	85	102	119	137	154	
26	41497	1664	1830	1996	2160	2325	2488	2651	2813	2975	164	16	33	49	66	82	99	115	131	148	
27	3136	3297	3457	3616	3775	3933	4091	4248	4404	4560	158	16	32	48	63	79	95	111	127	142	
28	4716	4871	5025	5179	5332	5484	5637	5788	5939	6090	153	15	31	46	61	76	92	107	122	137	
29	6240	6389	6538	6687	6835	6982	7129	7276	7422	7567	147	15	29	44	59	74	88	103	118	133	
30	47712	7857	8001	8144	8287	48430	8572	8714	8855	8996	143	14	29	43	57	71	86	100	114	128	
31	9136	9276	9415	9554	9693	9831	9969	0106	0243	0379	138	14	28	41	55	69	83	97	110	124	
32	50515	0651	0786	0920	1055	51188	1322	1455	1587	1720	134	13	27	40	54	67	80	94	107	120	
33	1851	1983	2114	2244	2375	2504	2634	2763	2892	3020	130	13	26	39	52	65	78	91	104	117	
34	3148	3275	3403	3529	3656	3782	3908	4033	4158	4283	126	13	25	38	50	63	76	88	101	114	
35	54407	4531	4654	4777	4900	55023	5145	5267	5388	5509	123	12	25	37	49	61	74	86	98	110	
36	5630	5751	5871	5991	6110	6229	6348	6467	6585	6703	119	12	24	36	48	60	71	83	95	107	
37	6820	6937	7054	7171	7287	7403	7519	7634	7749	7864	116	12	23	35	46	58	70	81	93	104	
38	7978	8092	8206	8320	8433	8546	8659	8771	8883	8995	113	11	23	34	45	56	68	79	90	102	
39	9106	9218	9329	9439	9550	9660	9770	9879	9988	0097	110	11	22	33	44	55	66	77	88	99	
40	60206	0314	0423	0531	0638	60746	0853	0959	1066	1172	107	11	21	32	43	54	64	75	86	96	
41	1278	1384	1490	1595	1700	1805	1909	2014	2118	2221	105	10	21	31	42	52	63	73	84	94	
42	2325	2428	2531	2634	2737	2839	2941	3043	3144	3246	102	10	20	31	41	51	61	72	82	92	
43	3317	3418	3518	3619	3719	3819	3919	4018	4147	4246	100	10	20	30	40	50	60	70	80	90	
44	4345	4444	4542	4640	4738	4836	4933	5031	5128	5225	98	10	20	29	39	49	59	68	78	88	
45	65321	5418	5514	5610	5706	65801	5896	5992	6087	6181	96	10	19	29	38	48	57	67	76	86	
46	6276	6370	6464	6558	6652	6745	6839	6932	7025	7117	93	9	19	28	37	47	56	65	75	84	
47	7210	7302	7394	7486	7578	7669	7761	7852	7943	8034	92	9	18	27	37	46	55	64	73	82	
48	8124	8215	8305	8395	8485	8574	8664	8753	8842	8931	90	9	18	27	36	45	54	63	72	81	
49	9020	9108	9197	9285	9373	9461	9548	9636	9723	9810	88	9	18	26	35	44	53	61	70	79	
50	9897	9984	0070	0157	0243	70329	0415	0501	0586	0672	86	9	17	26	34	43	52	60	69	77	
51	70757	0842	0927	1012	1096	1181	1265	1349	1433	1517	84	8	17	25	34	42	51	59	68	76	
52	1600	1684	1767	1850	1933	2016	2099	2181	2263	2346	83	8	17	25	33	41	50	58	66	75	
53	2428	2509	2591	2673	2754	2835	2916	2997	3078	3159	81	8	16	24	33	41	49	57	65	73	
54	3239	3320	3400	3480	3560	3640	3719	3799	3878	3957	80	8	16	24	32	40	48	56	64	72	
55	74036	4115	4194	4273	4351	74429	4507	4586	4663	4741	78	8	16	23	31	39	47	55	63	70	
56	4819	4896	4974	5051	5128	5205	5282	5358	5435	5511	77	8	15	23	31	38	46	54	62	69	
57	5587	5664	5740	5815	5891	5967	6042	6118	6193	6268	76	8	15	23	30	38	45	53	60	68	
58	6343	6418	6492	6567	6641	6716	6790	6864	6938	7012	74	7	15	22	30	37	45	52	59	67	
59	7085	7159	7232	7305	7379	7452	7525	7597	7670	7743	73	7	15	22	29	37	44	51	58	66	

Natural Number.	Common Logarithms of Natural Numbers.										Common Difference	Proportional Parts.								
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9
60	77815	7887	7960	8032	8104	78176	8247	8319	8390	8462	72	7	14	22	29	36	43	50	57	65
61	8533	8604	8675	8746	8817	8888	8958	9029	9099	9169	71	7	14	21	28	35	42	49	57	64
62	9239	9309	9379	9449	9518	9588	9657	9727	9796	9865	70	7	14	21	28	35	42	49	56	63
63	9934	0003	0072	0140	0209	80277	0346	0414	0482	0550	68	7	14	21	27	34	41	48	55	62
64	80618	0686	0754	0821	0889	0956	1023	1090	1158	1224	67	7	13	20	27	34	40	47	54	61
65	1291	1358	1425	1491	1558	81624	1690	1757	1823	1889	66	7	13	20	27	33	40	46	53	60
66	1954	2020	2086	2151	2217	2282	2347	2413	2478	2543	65	7	13	20	26	33	39	46	52	59
67	2607	2672	2737	2802	2866	2930	2995	3059	3123	3187	64	6	13	19	26	32	39	45	51	58
68	3251	3315	3378	3442	3506	3569	3632	3696	3759	3822	63	6	13	19	25	32	38	44	51	57
69	3885	3948	4011	4073	4136	4198	4261	4323	4386	4448	63	6	13	19	25	31	38	44	50	56
70	84510	4572	4634	4696	4757	84819	4880	4942	5003	5065	62	6	12	18	25	31	37	43	49	55
71	5126	5187	5248	5309	5370	5431	5491	5552	5612	5673	61	6	12	18	24	30	36	43	49	55
72	5733	5794	5854	5914	5974	6034	6094	6153	6213	6273	60	6	12	18	24	30	36	42	48	54
73	6332	6392	6451	6510	6570	6629	6688	6747	6806	6864	59	6	12	18	24	30	35	41	47	53
74	6923	6982	7040	7099	7157	7216	7274	7332	7390	7448	58	6	12	18	23	29	35	41	47	53
75	87506	7564	7622	7679	7737	87795	7852	7910	7967	8024	58	6	11	17	23	29	35	40	46	52
76	8081	8138	8195	8252	8309	8366	8423	8480	8536	8593	57	6	11	17	23	28	34	40	45	51
77	8649	8705	8762	8818	8874	8930	8986	9042	9098	9154	56	6	11	17	22	28	34	39	45	50
78	9209	9265	9321	9376	9432	9487	9542	9597	9653	9708	56	6	11	17	22	28	33	39	44	50
79	9763	9818	9873	9927	9982	90037	0091	0146	0200	0255	55	5	11	16	22	27	33	38	44	49
80	90309	0353	0417	0472	0526	0580	0634	0687	0741	0795	54	5	11	16	22	27	32	38	43	49
81	0849	0902	0956	1009	1062	1116	1169	1222	1275	1328	53	5	11	16	21	27	32	37	43	48
82	1381	1434	1487	1540	1593	1645	1698	1751	1803	1855	53	5	11	16	21	26	32	37	42	47
83	1908	1960	2012	2065	2117	2169	2221	2273	2324	2376	52	5	10	16	21	26	31	36	42	47
84	2428	2480	2531	2583	2634	2686	2737	2788	2840	2891	51	5	10	15	21	26	31	36	41	46
85	92942	2993	3044	3095	3146	93197	3247	3298	3349	3399	51	5	10	15	20	25	30	36	41	46
86	3450	3500	3551	3601	3651	3702	3752	3802	3852	3902	50	5	10	15	20	25	30	35	40	45
87	3952	4002	4052	4101	4151	4201	4250	4300	4349	4399	50	5	10	15	20	25	30	35	40	45
88	4448	4498	4547	4596	4645	4694	4743	4792	4841	4890	49	5	10	15	20	25	29	34	39	44
89	4939	4988	5036	5085	5134	5182	5231	5279	5328	5376	49	5	10	15	19	24	29	34	39	44
90	95424	5472	5521	5569	5617	95665	5713	5761	5809	5856	48	5	10	14	19	24	29	34	38	43
91	5904	5952	5999	6047	6095	6142	6190	6237	6284	6332	47	5	9	14	19	24	28	33	38	43
92	6379	6426	6473	6520	6567	6614	6661	6708	6755	6802	47	5	9	14	19	23	28	33	38	42
93	6848	6895	6942	6988	7035	7081	7128	7174	7220	7267	46	5	9	14	19	23	28	33	37	42
94	7313	7359	7405	7451	7497	7543	7589	7635	7681	7727	46	5	9	14	18	23	28	32	37	41
95	97772	7818	7864	7909	7955	98000	8046	8091	8137	8182	45	5	9	14	18	23	27	32	36	41
96	8227	8272	8318	8363	8408	8453	8498	8543	8588	8632	45	5	9	14	18	23	27	32	36	41
97	8677	8722	8767	8811	8856	8900	8945	8989	9034	9078	45	4	9	13	18	22	27	31	35	40
98	9123	9167	9211	9255	9300	9344	9388	9432	9476	9520	44	4	9	13	18	22	26	31	35	40
99	9564	9607	9651	9695	9739	9782	9826	9870	9913	9957	44	4	9	13	17	22	26	30	35	39
100	00000	0043	0087	0130	0173	0217	0260	0303	0346	0389	43	4	9	13	17	22	26	30	35	39
101	0432	0475	0518	0561	0604	0647	0689	0732	0775	0817	43	4	9	13	17	21	26	30	34	39
102	0860	0903	0945	0988	1031	1072	1115	1157	1199	1242	42	4	8	13	17	21	25	30	34	38
103	1284	1326	1368	1410	1452	1494	1536	1578	1620	1662	42	4	8	13	17	21	25	29	34	38
104	1703	1745	1787	1828	1870	1912	1953	1995	2036	2078	42	4	8	12	17	21	25	29	33	37
105	02119	2160	2202	2243	2284	02325	2366	2407	2449	2490	41	4	8	12	16	21	25	29	33	37
106	2531	2572	2612	2653	2694	2735	2776	2816	2857	2898	41	4	8	12	16	20	24	29	33	37
107	2938	2979	3019	3060	3100	3141	3181	3222	3262	3302	40	4	8	12	16	20	24	28	32	36
108	3342	3383	3423	3463	3503	3543	3583	3623	3663	3703	40	4	8	12	16	20	24	28	32	36
109	3743	3782	3822	3862	3902	3941	3981	4021	4060	4100	40	4	8	12	16	20	24	28	32	36

Common Logarithm.	Antilogarithmic Canon, being Natural Numbers to Common Logarithms.										Common Difference.	Proportional Parts.									
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
00	10000	00023	00046	0069	0093	10116	0139	0162	0186	0209	23	2	5	7	9	12	14	16	19	21	
01	0233	0257	0280	0304	0328	0351	0375	0399	0423	0447	24	2	5	7	10	12	14	17	19	21	
02	0471	0495	0520	0544	0568	0593	0617	0641	0666	0691	24	2	5	7	10	12	15	17	19	22	
03	0715	0740	0765	0789	0814	0839	0864	0889	0914	0940	25	2	5	7	10	12	15	17	20	22	
04	0965	0990	1015	1041	1066	1092	1117	1143	1169	1194	26	3	5	8	10	13	15	18	20	23	
05	11220	1246	1272	1298	1324	11350	1376	1402	1429	1455	26	2	5	8	10	13	16	18	21	23	
06	1482	1508	1535	1561	1588	1614	1641	1668	1695	1722	27	3	5	8	11	13	16	19	21	24	
07	1749	1776	1803	1830	1858	1885	1912	1940	1967	1995	27	3	5	8	11	14	16	19	22	25	
08	2023	2050	2078	2106	2134	2162	2190	2218	2246	2274	28	3	6	8	11	14	17	20	22	25	
09	2303	2331	2359	2388	2417	2445	2474	2503	2531	2560	29	3	6	9	11	14	17	20	23	26	
10	12589	2618	2647	2677	2706	12735	2764	2794	2823	2853	29	3	6	9	12	15	18	21	23	26	
11	2882	2912	2942	2972	3002	3032	3062	3092	3122	3152	30	3	6	9	12	15	18	21	24	27	
12	3183	3213	3243	3274	3305	3335	3366	3397	3427	3459	31	3	6	9	12	15	18	21	25	28	
13	3490	3521	3552	3583	3614	3646	3677	3709	3740	3772	31	3	6	9	13	16	19	22	25	28	
14	3804	3836	3868	3900	3932	3964	3996	4028	4060	4093	32	3	6	10	13	16	19	22	26	29	
15	14125	4158	4191	4223	4256	14289	4322	4355	4388	4421	33	3	7	10	13	16	20	23	26	30	
16	4454	4488	4521	4555	4588	4622	4655	4689	4723	4757	34	3	7	10	13	17	20	24	27	30	
17	4791	4825	4859	4894	4928	4962	4997	5031	5066	5101	34	3	7	10	14	17	21	24	28	31	
18	5136	5171	5205	5241	5276	5311	5346	5382	5417	5453	35	4	7	11	14	18	21	25	28	32	
19	5488	5424	5560	5596	5631	5668	5704	5740	5776	5812	36	4	7	11	14	18	22	25	29	32	
20	15849	5885	5922	5959	5996	16032	6069	6106	6144	6181	37	4	7	11	15	18	22	26	30	33	
21	6218	6255	6293	6331	6368	6406	6444	6482	6520	6558	38	4	8	11	15	19	23	26	30	34	
22	6596	6634	6672	6711	6749	6788	6827	6866	6904	6943	39	4	8	12	15	19	23	27	31	35	
23	6982	7022	7061	7100	7140	7179	7219	7258	7298	7338	40	4	8	12	16	20	24	28	32	36	
24	7378	7418	7458	7498	7539	7579	7620	7660	7701	7742	40	4	8	12	16	20	24	28	32	36	
25	17783	7824	7865	7906	7947	17989	8030	8072	8113	8155	41	4	8	12	17	21	25	29	33	37	
26	8197	8239	8281	8323	8365	8408	8450	8493	8535	8578	42	4	8	13	17	21	25	30	34	38	
27	8621	8664	8707	8750	8793	8836	8880	8923	8967	9011	43	4	9	13	17	22	26	30	35	39	
28	9055	9099	9143	9187	9231	9275	9320	9364	9409	9454	44	4	9	13	18	22	27	31	35	40	
29	9498	9543	9588	9634	9679	9724	9770	9815	9861	9907	45	5	9	14	18	23	27	32	36	41	
30	9953	9999	0045	0091	0137	20184	0230	0277	0324	0370	46	5	9	14	19	23	28	32	37	42	
31	20417	0464	0512	0559	0606	0654	0701	0749	0797	0845	48	5	9	14	19	24	28	33	38	43	
32	0893	0941	0989	1038	1086	1135	1184	1232	1281	1330	49	5	10	15	19	24	29	34	39	44	
33	1380	1429	1478	1528	1577	1627	1677	1727	1777	1827	50	5	10	15	20	25	30	35	40	45	
34	1878	1928	1979	2029	2080	2131	2182	2233	2284	2336	51	5	10	15	20	25	31	36	41	46	
35	22387	2439	2491	2542	2594	22646	2699	2751	2803	2856	52	5	10	16	21	26	31	36	42	47	
36	2909	2961	3014	3067	3121	3174	3227	3281	3335	3388	53	5	11	16	21	27	32	37	43	48	
37	3442	3496	3550	3605	3659	3714	3768	3823	3878	3933	55	5	11	16	22	27	33	38	44	49	
38	3988	4044	4099	4155	4210	4266	4322	4378	4434	4491	56	6	11	17	22	28	33	39	44	50	
39	4547	4604	4660	4717	4774	4831	4889	4946	5003	5061	57	6	11	17	23	29	34	40	46	51	
40	25119	5177	5235	5293	5351	25410	5468	5527	5586	5645	58	6	12	18	23	29	35	41	47	53	
41	5704	5763	5823	5882	5942	6002	6062	6122	6182	6242	60	6	12	18	24	30	36	42	48	54	
42	6303	6363	6424	6485	6546	6607	6669	6730	6792	6853	61	6	12	18	24	31	37	43	49	55	
43	6915	6977	7040	7102	7164	7227	7290	7353	7416	7479	63	6	13	19	25	31	38	44	50	56	
44	7512	7606	7669	7733	7797	7861	7925	7990	8054	8119	64	6	13	19	26	32	38	45	51	58	
45	28184	8249	8314	8379	8445	28510	8576	8642	8708	8774	66	7	13	20	26	33	39	46	52	59	
46	8840	8907	8973	9040	9107	9174	9242	9309	9376	9444	67	7	13	20	27	34	40	47	54	60	
47	9512	9580	9648	9717	9785	9854	9923	9992	0061	0130	69	7	14	21	27	34	41	48	55	62	
48	30200	0269	0339	0409	0479	30549	0620	0690	0761	0832	70	7	14	21	28	35	42	49	56	63	
49	0903	0974	1046	1117	1189	1261	1333	1405	1477	1550	72	7	14	22	29	36	43	50	58	65	

Common Logarithm.	Antilogarithmic Canon, being Natural Numbers to Common Logarithms.										Common Difference.	Proportional Parts.									
	0	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
50	31623	1696	1769	1842	1915	31989	2063	2137	2211	2285	74	7	15	22	29	37	44	52	59	66	
51	2359	2434	2509	2584	2659	2734	2810	2885	2961	3037	75	8	15	23	30	38	45	53	60	68	
52	3113	3189	3266	3343	3420	3497	3574	3651	3729	3806	77	8	15	23	31	39	46	54	62	69	
53	3884	3963	4041	4119	4198	4277	4356	4435	4514	4594	79	8	16	24	32	39	47	55	63	71	
54	4674	4754	4831	4911	4995	5075	5156	5237	5318	5400	81	8	16	24	32	40	48	56	65	73	
55	35181	5563	5645	5727	5810	35892	5975	6058	6141	6224	83	8	17	25	33	41	50	58	66	74	
56	6308	6392	6475	6559	6644	6728	6813	6898	6983	7068	84	8	17	25	34	42	51	59	68	76	
57	7154	7239	7325	7411	7497	7581	7670	7757	7844	7931	86	9	17	26	35	43	52	61	69	78	
58	8019	8107	8194	8282	8371	8459	8548	8637	8726	8815	88	9	18	27	35	44	53	62	71	80	
59	8905	8994	9084	9174	9264	9355	9446	9537	9628	9719	91	9	18	27	36	45	54	63	72	81	
60	9811	9902	9994	0087	0179	40272	0365	0458	0551	0644	93	9	19	28	37	46	56	65	74	83	
61	10738	0832	0926	1020	1115	1210	1305	1400	1495	1591	95	9	19	28	38	47	57	66	76	85	
62	1687	1783	1879	1976	2073	2170	2267	2364	2462	2560	97	10	19	29	39	48	58	68	78	87	
63	2658	2756	2855	2954	3053	3152	3251	3351	3451	3551	99	10	20	30	40	50	60	69	79	89	
64	3652	3752	3853	3954	4055	4157	4259	4361	4463	4566	102	10	20	30	41	51	61	71	81	91	
65	44468	4771	4875	4978	5082	45186	5290	5394	5499	5604	104	10	21	31	42	52	62	73	83	94	
66	5709	5814	5920	6026	6132	6238	6345	6452	6559	6666	106	11	21	32	43	53	64	74	85	96	
67	6774	6881	6989	7098	7206	7315	7424	7534	7643	7753	109	11	22	33	44	54	65	76	87	98	
68	7863	7973	8084	8195	8306	8417	8529	8641	8753	8865	111	11	22	33	45	56	67	78	89	100	
69	8978	9091	9204	9317	9431	9545	9659	9774	9888	0003	114	11	23	34	46	57	68	80	91	103	
70	50119	0234	0350	0466	0582	50699	0816	0933	1050	1168	117	12	23	35	47	58	70	82	93	105	
71	1286	1401	1523	1642	1761	1880	2000	2119	2240	2360	119	12	24	36	48	60	72	84	95	107	
72	2481	2602	2723	2845	2966	3088	3211	3333	3456	3580	122	12	24	37	49	61	73	85	98	110	
73	3703	3827	3951	4075	4200	4325	4450	4576	4702	4828	125	12	25	37	50	62	75	87	100	112	
74	4954	5081	5208	5335	5463	5590	5719	5847	5976	6105	128	13	26	38	51	64	77	89	102	115	
75	56234	6364	6494	6624	6754	56885	7016	7148	7280	7412	131	13	26	39	52	65	78	92	105	118	
76	7544	7677	7810	7943	8076	8210	8345	8479	8614	8749	134	13	27	40	54	67	80	94	107	120	
77	8884	9020	9156	9293	9429	9566	9704	9841	9979	0117	137	14	27	41	55	69	82	96	110	123	
78	60256	0395	0534	0674	0813	60954	1094	1235	1376	1518	140	14	28	42	56	70	84	98	112	126	
79	1660	1802	1944	2087	2230	2373	2517	2661	2806	2951	143	14	29	43	57	72	86	100	115	129	
80	63096	3241	3387	3533	3680	63826	3973	4121	4269	4417	147	15	29	44	59	73	88	103	117	132	
81	4565	4714	4863	5013	5163	5313	5464	5615	5766	5917	150	15	30	45	60	75	90	105	120	135	
82	6069	6222	6374	6527	6681	6834	6988	7143	7298	7453	154	15	31	46	61	77	92	108	123	138	
83	7608	7764	7920	8077	8234	8391	8549	8707	8865	9024	157	16	31	47	63	79	94	110	126	142	
84	9183	9343	9503	9663	9823	9984	0146	0307	0469	0632	161	16	32	48	64	80	97	113	129	145	
85	70795	0958	1121	1285	1450	71614	1779	1945	2111	2277	165	16	33	49	66	82	99	115	132	148	
86	2444	2611	2778	2946	3114	3282	3451	3621	3790	3961	168	17	34	51	67	84	101	118	135	152	
87	4131	4302	4473	4645	4817	4989	5162	5336	5509	5683	172	17	34	52	69	86	103	121	138	154	
88	5858	6033	6208	6384	6560	6736	6913	7090	7268	7446	176	18	35	53	71	88	106	124	141	159	
89	7625	7804	7983	8163	8343	8524	8705	8886	9068	9250	181	18	36	54	72	90	108	126	145	163	
90	9433	9616	9799	9983	0168	80353	0538	0724	0910	1096	185	18	37	55	74	92	111	129	148	166	
91	81283	1470	1658	1846	2035	2224	2414	2604	2794	2985	189	19	38	57	76	95	113	132	151	170	
92	3176	3368	3560	3753	3946	4140	4333	4528	4723	4918	194	19	39	58	77	97	116	136	155	174	
93	5114	5310	5507	5704	5901	6099	6298	6497	6696	6896	198	20	40	59	79	99	119	139	158	178	
94	7096	7297	7498	7700	7902	8105	8308	8512	8716	8920	203	20	41	61	81	101	122	142	162	182	
95	9125	9331	9536	9743	9950	90157	0365	0573	0782	0991	207	21	41	62	83	104	124	145	166	187	
96	91201	1411	1622	1833	2045	2257	2470	2683	2897	3111	212	21	42	64	85	106	127	149	170	191	
97	3325	3541	3756	3972	4189	4406	4624	4842	5060	5280	217	22	43	65	87	109	130	152	174	195	
98	5499	5719	5940	6161	6383	6605	6828	7051	7275	7499	222	22	44	67	89	111	133	156	178	200	
99	7724	7949	8175	8401	8628	8855	9083	9312	9541	9770	227	23	45	68	91	114	136	159	182	205	

Tables of Barometrical and Thermometrical Observations, made in Affghanistan. Upper Scinde, and Kutch Gundava, during the years 1839-40. By DR. GRIFFITH.

A copy of these Tables was furnished to the Surveying Officers of the Army of the Indus, as their Barometers ceased to be effective soon after leaving Quettah. No other register was I believe kept.

Columns 8 and 9 require some explanation, they contain the readings off of the Thermometer, Barometer invented by Dr. Woollaston, but with the substitution of an ordinary Thermometer for his delicate one. Of these I have had several in India, but never met with one that was in working order. The great weight and thinness of the bulb, likewise renders them very liable to be broken.

After adjusting the new tubes, and marking on them zero marks corresponding to the zero of the scale, I formed a scale of valuations of each degree from comparisons with the Barometers. I had similar Thermometers in use in Bootan, and have had ample opportunities of knowing that they will intimate altitudes to within trifling differences of travelling Barometers, than which they are much more portable. Ordinary thermometers for ascertaining altitudes by boiling water, vary a good deal, and are not to be depended upon. My instruments are now in Captain Sander's possession, and if they have escaped unbroken, after comparing them with the best barometers in Calcutta, I shall do myself the honour of presenting the results to Government.

These Barometrical observations were made with an Englefield's Barometer, and though made in a dry climate, and with every care, as to drying the inside of the tube with a silk sponging-wire, as well as to allow no air-bubbles to remain, can only be considered as approximative. The mercury was not as pure as it might have been, and none of the Chemists in Calcutta could supply me with fresh distilled mercury.

There is also considerable laxity in the columns of attached and detached thermometers owing to breakages, occasional reduction to one instrument, and the general place of observation, a tent, in different parts of which very various temperatures are to be found.

As I found that screwing, however lightly, the ordinary cistern to the tube (to fix it) occasioned some of the tubes to break, I subsequently, at Cabool, abandoned the plan altogether, and used a wooden box as cistern, sufficiently large to enable the inverted tube, closed by the forefingers, to be inserted under the liquid; the float was adjusted as usual. I can recommend this plan as a practical one, and much easier than the use of the ordinary cistern.

The instrument was put up afresh every day, even during halts,—the tables shew that with care, and using one tube, the readings of various days do not differ very much.

Date.	Station.	Time.	Barom.	Attached Therm.	Det. Therm.	Woollast No. 1 old.	Woollast No. 2.	Barome- ter height in feet.	Therm. height in feet.	Remarks.
Dec. 13	Loodianah,	10 A. M.	29.294	63.	62.	668.5	..	..	..	Cloudy, threatening rain.
"	"	12 "	29.260	64.5	64.	670.0	752.5	..	..	Fine.
"	"	4 P. M.	29.274	64.	64.	671.	752.	..	..	Fine.
"	"	10 A. M.	29.360	63.	63.	671.5	755.	..	..	Fine.
"	"	4 P. M.	29.296	65.	65.	670.	754.5	..	..	Windy, clear.
"	"	10 A. M.	29.316	63.	63.	671.	750.5	..	..	Windy.
"	"	12 "	29.302	64.	64.	..	..	..	..	Cloudy.
"	"	4 "	29.280	64.5	64.5	669.5	750.5	..	..	Cloudy.
"	"	10 "	29.380	62.	62.5	670.5	751.5	..	..	Cloudy.
"	"	12 "	29.360	65.	65.	..	..	..	..	Fine.
"	"	4 "	29.340	65.	65.	671.	750.	..	..	Fine.
"	"	10 "	29.244	63.	63.	668.	750.	..	..	Cloudy.
"	"	12 "	29.242	65.	66.	..	..	..	..	Fineish, wind strong S.
"	"	4 "	29.202	66.	66.	668.	748.5	..	..	Cloudy.
"	"	10 "	29.380	66.5	66.	668.5	749.5	..	..	Fine.
"	"	12 "	29.369	68.	67.	..	..	..	..	Cloudy.
"	"	5 "	29.314	66.	66.	668.5	749.	..	..	Fine.
"	"	10 "	29.360	66.	66.	667.5	749.5	..	..	Ditto.
"	"	12 "	29.300	68.5	68.	..	..	..	..	Very windy W. S.
"	"	5 "	29.210	66.	66.	..	..	..	..	Ditto.
"	"	10 "	29.240	65.	64.8	665.5	748.	..	..	Ditto.
"	"	21 "	29.230	66.	66.	..	..	..	..	Ditto.
"	"	4 "	29.210	67.	66.5	664.5	746.5	..	..	Ditto.
"	"	10 ¹ "	29.240	67.	66.5	665.	746.5	..	..	Ditto.

Mean of Loodianah observations reduced according to Broadfoot's Notes 29-286.

Date.	Station.	Time.	Barm.	Therm. Attached	Therm. Det.	Woollast No. 1 old.	Woollast No. 2.	Baromet. height in feet.	Therm. Height in feet.	Remarks.
Dec. 23	Loodianah.	12 A. M.	29.2214	67.	67.	664.5	746.	..	Mean of Loodianah observations reduced according to Broadfoot's Notes 29-286.	Very windy W. S. clear.
" "	"	4 "	29.1431.	67.	66.5	663.5	748.	..		Ditto ditto.
" 24	"	10 "	29.2122	65.	64.	..	..	..		Fine calm.
" "	"	12 "	29.1334	67.	67.	..	..	..		Ditto.
" "	"	4 "	29.1122	66.	66.	665.	747.	..		Fine, ditto.
" 27	"	10 "	29.410	61.	61.	..	..	..		Cloudy, rain.
" "	"	12 "	29.404	..	..	..	..	..		Rain.
" "	"	4 "	29.3314	60.	61.	..	..	..		Cloudy.
" 1	Shikarpore.	12 "	30.031	73.5	..	..	..	..		Fine, calm.
" "	"	4 "	30.000	81.	..	..	..	..		Ditto ditto.
" 3	"	10 "	30.0224	70.	70.	674.	755.5	..		Fine, calm.
" "	"	12 "	30.0122	77.	77.	..	..	..		Calm.
" "	"	4 "	29.912.	78.	78.	673.	754.5	..		Windy—in gusts, N. N. E.
" 4	"	10 "	30.000	70.	70.	672.5	752.5	..		Fine, calm.
" "	"	12 "	29.8411.	78.5	78.	..	..	..		Sultry, calm.
" "	"	4 "	29.8312.	81.	81.	670.5	752.	..		N. W. Moderate wind.
" 5	"	10 "	29.944	69.	69.	668.5	751.5	..		N. E. Wind.
" "	"	12 "	29.9017	74.5	..	..	..	..		Ditto ditto.
" "	"	0	29.8310	79.	..	675.5 read just.	751.	..		Calm.
" "	"	10 "	30.100	68.	..	677.5	753.5	..		5 1/5 A. M. Calm, clear, Therm. 34 in air.
" 6	"	12 "	30.0415	75.	..	..	..	..		Sultry.
" "	"	4 "	30.0110	82.5	..	676.8	752.5	..		Fine, calm—Therm. 5 A.M. 35.
" 7	Feby.	10 "	30.130	77.5	..	678.	755.5	..		

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast old.	Woollast new.	Barm. Height.	Therm. Height.	Remarks.
Feb. 7	Shikarpore.	12 A. M.	30.110	79.	..	677.5	..	..	Therm—varying from 41 to [92 in the shade.	
" "	"	4 "	30.016	82.	..	..	753.	..		
" 10	"	10 "	29.830	72.5	..	..	752.	..		
" "	"	12 "	29.800	85.	..	..	..	..		Calm, sultry, winds.
" "	"	4 "	29.720	94.	..	6.	752.5	..		Ditto ditto.
" 11	"	10 "	29.829	72.	..	673.	751.	..		9 P. M 62.5 A. M. 50.
" "	"	12 "	29.800	85.	..	..	..	..		Cloudy, slight E. wind.
" "	"	4 "	29.710	92.	..	672.5	752.	..		Sultry.
" 12	"	10 "	29.810	76.	..	670.5	751.5	..		E. wind, strong E. wind.
" "	"	12 "	29.730	82.	..	..	..	..		E. wind, night.
" "	"	4 "	29.620	88.	..	670.	751.5	..		Slight ditto, clear.
" 13	"	10 "	29.617	72.	..	668.	750.	..		E. wind, clear cloudy in the [morning.
" "	"	12 "	29.600	81.	..	..	..	..		Calm.
" "	"	4 "	29.510	88.5	..	669.5	750.	..		Strong N. W. hazy.
" 14	"	10 "	29.640	76.5	..	669.5	751.5	..		
" "	"	12 "	29.630	85.	..	..	..	..		Calm, sultry.
" "	"	4 "	29.617	..	..	670.	750.	..		Strong wind N. N. W.
" 15	"	10 "	29.847	75.	..	..	..	..
" "	"	12 "	29.824	82.	..	mean 671.6	mean 751.5	..		Calm, close.
" "	"	4 "	29.740	85.	..	..	..	..		Calm, cold in the morning.
" 16	"	10 "	29.910	72.5	..	..	..	..		Ditto ditto.
" "	"	12 "	29.840	82.	..	..	..	..		Ditto ditto. [rain in night.
" "	"	4 "	29.8016	86.	..	..	..	..		Cloudy—E. wind sprinkling
" 18	"	" "	29.830	68.	..	670.	750.	..		

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast old.	Woollast new.	Barm. Height	Therm. Height	Remarks.
Feb. 18	Shikarpore.	12 A.M.	29.8311	70.	..	..	..	..	..	Showery.
"	"	4 "	29.800	65.	..	671.	751.5	..	..	Ditto.
"	"	12 "	29.800	71.	..	..	..	..	..	Fine E. wind.
"	"	4 "	29.720	72.	..	..	..	..	..	Cloudy.
"	Joke,	10 "	29.918	80.	..	672.5	753.5	..	..	40.5 A. M. Durand's Bar :
"	"	4 "	29.832	84.	..	672.	753.	..	..	12 P. M. 30.028 cloudy.
March 1	Bagh,	4 "	29.812	84.	..	..	..	..	..	Ditto, Bar. 29.939.
"	"	10 "	29.820	75.	..	..	..	..	..	Calm.
"	"	12 "	29.835	86.	..	29.8	18.	..	..	Calm, sultry.
"	"	4 "	29.754	90.	..	Att.	85.4	..	..	Do. Br. at noon 29.950-84.5.
"	"	10 "	29.887	81.	..	Det.	"	..	..	Do. at 4 do. 29.857-875.
"	"	12 "	29.848	93.5	..	..	"	..	..	Do. at 10 A. M. 29.909-77.7.
"	"	4 "	29.771	88.5	88.	..	..	..	..	Do. 12 do. 29.918-90.6.
"	Mysoor,	4 "	29.725	92.	97.	..	62.	..	..	Sultry.
"	"	10 "	29.783	82.	89.	29.7	88.5	..	..	Sultry.
"	"	12 "	29.807	89.5	89.	Att.	91.4	..	..	Sultry.
"	"	4 "	29.732	91.	91.5	Det.	..	..	..	Calm, 96.
"	Dadur,	4 "	29.446	87.	87.	..	..	..	..	Calm.
"	"	10 $\frac{1}{2}$ "	29.438	88.	88.	..	..	..	..	S. W. wind.
"	"	12 "	29.330	87.5	87.	..	..	..	..	Cloudy.
"	"	4 "	29.343	80.	80.5	..	..	..	..	Calm, passing cloud.
"	"	10 $\frac{1}{2}$ "	29.372	85.	85.5	..	..	..	..	S. wind.
"	"	12 "	29.372	85.	81.	..	..	..	..	Cloudy.
"	"	4 "	29.237	80.	..	..	..	..	..

Mean of all observations reduced according to
Broadfoot's remarks 29.838.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
March 9	Dadur.	12 A. M.	29.295	81.5	81.5	29.	351			W.W., N.W., N.W. [day.
"	"	4	29.263	81.	81.	Att.	825	742.6		Strong N. wind throughout
"	"	10	29.436	70.5	70.5	Det.	824			Clouds of dust wind continued.
"	11	10	"	"	"	"	"			Strong, occasionally violent
"	"	12	29.406	80.	80.5	29.	371	Att. 75.	D. 757	[until 12 last night.
"	"	4	29.335	70.	71.	"	"			
"	Camp river.	11	29.218	79.	78.	29.	186	904.1		Heavy clouds, violent squall.
"	"	12	29.210	83.	85.	Att.	796			Slight rain about 9 P. M.
"	"	4½	29.130	77.	77.	Det.	80			Calm.
"	Gunnab. ...	10	29.071	81.5	81.5	Bar.	Mean			
"	"	12	29.063	82.	84.5	Att.	28.996	108.1		Cloudy.
"	"	4	28.966	84.	85.	Det.	799			Calm.
"	"	5 P. M.	28.968	75.	75.	"	806			Cloudy, windy.
"	14	10	28.988	77.	78.	"	"			
"	"	12	28.995	85.	85.5	"	"			
"	"	5½	28.920	75.	75.	"	82			Cloudy, slight rain at 3 P. M.
"	Beebinanca.	10	28.429	77.	77.	28.382	"			Fine, clear.
"	"	12	28.399	80.	81.	Att.	763	1695		Cloudy, drops of rain.
"	"	5½	28.317	72.	72.5	Det.	768			Cloudy, but finer.
"	"	10	27.603	72.	71.5	"	"			Fine.
"	Abigoon. ...	12	27.603	73.5	74.	27.535	"			Cloudy, rather rain in night
"	"	4	27.524	78.	78.	Att.	709	2540		and in morning of 17.
"	"	10	27.513	65.	65.5	"	"			Cloudy

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
March 17	Abigoon. . .	12 P. M.	27.514	69.	70.	27. Att.	71.1	..	..	Cloudy.
" "	" "	4 "	27.454	68.	68.	..	..	..	..	Violent wind, blew down Bar., and broke it. Ther. 26 at sun rise; at 5 $\frac{1}{2}$ 48. Ice in morning, following morning Ther. 38' rather cloudy.
" 18*	Sirkhagoor.	11 "	25.669	64.	64.	..	615.	4494	..	Cloudy threatening, slight rain, cloudy.
" 20	Mungel. . .	12 "	none.	..	..	705.	614.5	5793	..	Passing clouds, S. W. wind. Ice on Pools or at Quetta, on 25, 7 A.M.
" "	" "	5 $\frac{1}{2}$ "	none.	..	..	704.5	615.5	..	..	Water boils 200.5 at 12 cloudy. Over cast at 4, 200.6, very threatening, slight rain, rain, fine yesterday, threatened rain. Water 200.8. 4 P.M. water 2006.
" 23	Surab. . .	10 "	none.	0	64.5	706.5	615.5	..	..	New tube, windy NE. clear.
" "	" "	4 "	..	0	..	705.5	..	5793	..	Water 201.1, clearish.
" 24	" "	10 "	..	..	62.	705.5	..	..	..	Fine clear 201.4.
" 27	Quettah. . .	10 "	24.720	64.	65.	707.5	614.5	556.3	5537.	Cloudy.
" "	" "	4 "	..	64.	64.	706.5	614.5	new.	..	..
April 2	" "	10 $\frac{1}{2}$ "	24.728	68.	67.	706.5	614.5	..	..	..
" "	" "	4 "	..	72.	72.	707.5	615.	..	..	..
" 8	Hydroya. . .	12 "	25.124	82.	82.	..	..	..	..	..
" "	" "	4 "	25.043	84.	84.	711.5	620.5	5259	..	..
" 9	Hykuly. . .	1 $\frac{1}{2}$ "	25.292	86.5	82.5	713.5	622.5	5063	..	..
" "	" "	3 "	25.206	76.	77.5	713.5	622.5	..	..	..
" 11	Kojhak Pass.	2 $\frac{1}{2}$ "	23.586	75.	75.	695.5	603.5	..	..	..
" "	" "	4 "	23.578	70.	73.	..	..	..	..	..

* New tube the former one having been broken at Sir-i-Bolan.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woolast new.	Woolast old.	Barm. Height.	Therm. Height.	Remarks.
April 12	Kojhak Pass.	10 $\frac{1}{2}$ P. M.	28.656	70.	70.	696.5	602.5	6848	{ 6824 new.	Fineish, water 198.5.
"	"	12 "	23.656	79.5	79.5	..	..	..	{ 6737 old.	Fine.
"	"	3 "	23.619	73.5	73.5	..	..	..	7457	Water 297.4 Br. observation
"	Summit of Pass.	4 "	23.199	71.5	72.5	691.5	596.5	744.9	old.	not very accurate, 198.3
"	"	"	"	"	"	"	"	"	"	Durand's Bar, 23.162.
" 13	Kojhak.	10 "	23.625	49.5	49.5	696.5	603.7	..	..	Water 200.5 } Fine, gusts of
" 14	Chaky or	10 $\frac{1}{2}$ A. M.	none.	..	80.	706.5	615.5	..	5804	Water 200.4 } wind occasion-
"	Chunnar.	3 P. M.	none.	..	86.	707.5	615.	5677	by Canda-har.	ally, cloudy especially in the
" 15	"	11 $\frac{1}{2}$ "	24.729	..	84.	..	..	..	..	morning.
"	"	"	"	"	"	"	"	"	"	Fine, windy, water 200.5.
"	"	12 $\frac{1}{2}$ "	24.715	..	86.	708.5	615.5	200.5	5677	"
"	"	4 "	24.673	..	82.5	707.	615.5	200.4	..	"
" 17	"	10 "	26.206	..	85.	723.	632.	203.4	..	"
"	Durd e Golai.	10 "	26.206	..	91.	..	..	..	4036	"
"	"	12 "	26.162	..	93.	723.5	631.	203.3	..	Alterations of Temp. are very
"	"	4 $\frac{1}{2}$ "	26.083	..	97.	..	..	..	..	great from 45 to 97 to 100.
" 20	"	10 "	26.206	92.	97.	..	..	..	..	The difference between the
"	"	12 "	26.215	96.	102	723.	633.5	203.6	..	Therm. is due to the at-
"	"	4 "	26.132	93.	98.	723.5	633.	203.4	..	tached one being close to
"	"	"	26.306	98.	98.	..	..	..	3918	the ground in this and all
" 21	Kilah Rettolah.	12 "	26.306	98.	98.	..	..	..	..	previous cases.
"	"	"	"	"	"	"	"	"	"	Calm, very hot.
"	"	4 "	26.226	98.	98.	..	..	..	..	"
" 23	River Tuktopol.	10 "	26.563	..	94.5	724.5	635.	203.8	..	"

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woolast new.	Woolast old.	Barm. Height.	Therm. Height.	Remarks.
April 23	River Tuktopol,	12 A.M.	26.533	98.	100.5	724.5	635.	203.8	3630	Windy gusts, over clouded.
" "	" "	3 "	26.436	" "	95.	"	"	"	"	"
" "	" "	4 "	"	" "	"	723.5	635.	203.8	"	"
" 24	Deh Hajji,	12 "	"	" "	104.	726.	637.	204.	"	"
" 25	Khashab,	12 "	"	" "	"	724.5	635.	203.8	"	Clear wind from W. N. W.
" 26	" "	10 "	"	" "	93.	726.5	637.	203.9	"	Calm.
" "	" "	10½ "	26.536	" "	91.	"	"	"	"	"
" "	" "	12 "	26.523	" "	92.5	"	"	"	3630	Usual westerly wind, hazy.
" "	" "	4 "	26.459	" "	91.5	724.	634.	"	"	Ditto ditto.
" 28	Candehar,	10½ "	26.527	86.	88.	725.5	635.5	203.9	"	Calm sultry.
" "	" "	12 "	26.526	86.	87.	"	"	"	"	Durand's Bar. Githa 26.574.
" "	" "	4 "	26.454	88.5	92.	725.	634.5	203.8	"	Sun's 26.538.
" 29	" "	10 "	26.676	87.	88.	726.5	636.	204.	"	97 in Sun, 104.4 p. 106.
" "	" "	12 "	26.663	93.5	97.	"	"	"	"	Cloudy.
" "	" "	4 "	26.562	93.	97.	725.	634.8	203.9	"	Calm, less wind throughout
" 30	" "	10¼ "	26.719	93.	97.	725.6	637.7	204.	"	the day 102 = 102.
" "	" "	12 "	26.698	94.	98.	"	"	"	"	"
" "	" "	4 "	26.652	93.5	97.	725.5	634.8	203.9	"	W. wind since 1 p. m.
" 1	" "	10 "	26.742	90.	96.	"	"	3472	new.	Calm, sultry.
" "	" "	12 "	26.715	93.5	97.	"	"	3359	"	Westerly wind rising.
" "	" "	4 "	26.669	95.	98.5	"	"	"	old.	Westerly wind strongish.
" 2	" "	10 "	26.719	90.5	95.	"	"	"	"	"
" "	" "	12 "	26.710	95.	99.	"	"	"	"	WSW. wind, moderate clear,
" "	" "	4 "	26.624	95.	98.5	"	"	"	"	wind warmish, partial.

May

Date.	Stations.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
June 28*	Killa Azim,	12 A.M.	26.240	95.	95.	..	..	3945	..	No wind, violent W. wind yesterday, 92 with latters.
" 29	Turmink, ..	12 "	25.858	101.5	101.5	..	..	4418	..	Calm, sultry E. wind up to 11 [A. M.
" 30	Shakr-i, ..	1 ½ "	25.699	102.	102.	..	..	..	..	Ditto ditto ditto.
" "	Suja, ..	1 "	25.689	101.5	101.5	..	..	..	..	Cold morning, strong E. wind, now calm.
" "	" "	2 "	25.676	102.	102.	..	..	4618	..	
July 1	Tide anday,	11 "	25.512	95.5	95.5	..	..	..	..
" "	" "	12 "	25.494	99.	99.	..	..	..	..
" "	" "	1 "	" 494	97.5	97.5	..	..	4829	..	W. wind strong ditto, ditto.
" "	" "	2 "	" 478	98.	98.	..	..	..	..	Close Sultry E. wind until [8 A. M.
" 3	Juldak, ..	12 "	25.028	95.	95.	..	..	5396	..	Ditto ditto.
" "	" "	1 "	25.004	95.5	95.5	..	..	..	..	Ditto ditto.
" "	" "	2 "	24.970	95.	95.	..	..	..	..	Thunder and rain 5, 6 P. M.
" 4	Khilat-i, ..	3 "	24.714	102.	102.	..	..	..	..	Some clouds, calm, very hot.
" "	" "	4 "	24.705	102.8	102.8	..	..	..	..	134° hung in sun, on ground.
" 5	Gilzie, ..	10 "	24.765	100.	100.	719.	612.8	5773	..	139° W. wind occasionally.
" "	" "	11 "	24.753	89.	89.	4 P. M.	..	..	..	Calm, E. wind { 6° in excess of former adjust-
" "	" "	12 "	24.753	91.5	91.5	713.*	614.	..	..	ment, ergo—all determinations from 52.4 P. M.
" "	" "	1 "	24.743	94.5	94.5	New adjust.	..	..	..	Do. do. strong gusts. { lower.
" "	" "	2 "	24.743	93.	93.	..	..	..	..	Do. do.
" "	" "	3 "	24.738	95.	95.	97	..	..	..

* One Thermometer broken, the 2d Column or that of the detached Therm. is quite superfluous.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
July 6	Sia-i-Asp,	12 A.M.	24.532	92.	92.			5973	..	Calm, sultry, clear sheet.
"	"	1 "	24.505	91.5	91.5		Index of verniers corresponds to 700 square, not at base upper edge to 700 upper most of two marks.	..	..	W. wind commencing, lighting.
"	"	2 "	24.500	93.5	93.5			..	..	W. wind clouds in the evening.
"	"	1 "	24.402	91.5	91.5			..	..	Calm, not very close.
"	Tazee Noorok,	2 "	24.378	91.	91.			6136	..	W. E. wind, slight air fresh.
"	Tazee, ..	12 $\frac{1}{2}$ "	24.193	89.	89.			..	..	Cloudy morning, slight N.E. [wind.
"	"	1 "	24.185	87.	87.			6321	..	Cool.
"	"	2 "	24.181	84.	84.			..	..	N. E. wind strong, cool.
"	Shuftul, ..	12 "	24.058	84.	84.			..	..	Calm, cloudy 46° sunrise 10th.
"	"	1 "	24.046	86.	86.			..	..	Occasional breezes.
"	"	2 "	24.046	87.	87.			..	..	Cloudy W. wind, clear night.
"	"	12 "	24.062	88.5	88.5			6514	..	Strong W. wind.
"	"	1 "	24.054	91.5	91.5			..	..	Ditto ditto, scattered clouds.
"	"	2 "	24.006	91.	91.			..	..	Ditto ditto clear, clear night.
"	Chushum ..	12 "	28.941	89.	89.			..	..	W. wind getting up.
"	Shadee, ..	1 "	23.941	89.	89.			6668	..	W. wind.
"	"	2 "	23.934	90.	90.			..	..	Ditto ditto clear, 9 P. M.
"	"	12 "	23.858	90.	90.			..	..	[tial clouds.
"	"	1 "	23.806	91.8	91.8	704.	605.	6810	..	S. W. wind commence, partial clouds.
"	"	2 "	23.806	92.	92.			..	..	Cloudy.
"	"	3 "	23.806	92.	92.			..	..	Overcast, S. W. wind.

6621
new.
6745
old.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
July 13	Ajoghan, ..	1 A.M.	23.609	89.	89.	..	..	..	{ 7016 new. 6940 } old.	Violent S.W. wind since 11 $\frac{1}{2}$. Clear, water boiled out of influence of wind.
"	"	2 "	23.580	90.	90.	700.5	602.	7068		
"	14 Mookhloor, ..	1 "	23.520	86.5	86.5	701.5	600.	..		Ditto do, purdahs down.
"	"	2 "	23.520	88.5	88.5	700.	..	..		W. wind commencing.
"	15 "	10 "	23.601	80.	80.	702.3	602.5	..		S. W. wind, rather strong.
"	"	11 "	23.594	81.5	81.5	..	..	7091		Calm, clear.
"	"	12 "	23.594	83.	83.	..	..	..		Slight S. W. breezes.
"	"	1 "	23.591	85.	85.	..	..	..		Ditto, stronger.
"	"	2 "	23.591	86.	86.	..	..	..		Ditto, occasional.
"	"	3 "	23.586	86.5	86.5	..	..	..		Steady wind. Boiling point varies with the wind. The above are the mean of 6 and 8 observers.
"	"	4 "	23.578	86.	86.	698.9	599.5	..		Hazy morning, cloudy, S. W. wind.
"	16 Aba, ..	1 "	23.397	86.	86.	..	..	7325		Commencing rain, heavy at night.
"	17 Jumrat, ..	1 "	23.305	87.	87.	697.6	595.8	..		Calm.
"	"	2 "	23.287	87.	87.	..	..	7426		{ Calm, clear, slight E. wind occasionally.
"	18 Near Moo-roohikee, }	12 "	23.453	83.	83.	699.8	598.	..		

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
July 18	Near Moor-roohikee, } 1 Mile s. w. dist.	1 A.M.	23.435	85.	85.	..	..	7309	..	Calm, clear, rain from 11-12 at night.
"	"	2 "	23.412	88.	88.	698.5	597.	..	..	Calm, some clouds.
"	Urgutto, ..	12 "	23.277	81.	81.	696.3	596.8	..	..	W. wind slight.
"	"	1 "	23.263	83.	83.	..	..	7502	..	Thunder and heavy clouds to N. and W. E.
"	"	2 "	23.246	86.	86.	697.6	597.6	..	{ 7391 old.	Calmish, or slight W. wind, clear, no rain last night.
"	Nanee, ..	1 "	23.336	91.	91.	697.1	697.2	..	..	Calm, sultry.
"	"	10 "	..	..	86.	696.	596.8	..	..	Westerly wind light.
"	Ghuznee, ..	12 "	23.060	87.	87.	..	..	..	..	Cloudy morning.
"	"	1 "	23.038	88.	88.	..	..	..	..
23	"	10 "	23.031	87.	87.	..	..	..	..
"	"	11 "	23.030	88.	88.	695.	594.2	..	..
"	"	12 "	23.016	..	..	..	..	..	..
"	"	1 1/2 "	22.986	..	..	..	..	..	..
"	"	2 "	22.986	..	..	..	..	..	..
"	"	3 "	22.960	..	..	..	..	..	..	Strong E. N. E. wind from 6 till 11 A. M. clouds of dust.
"	"	4 "	22.960	..	..	693.1	593.5	..	..	E. N. E. gusts, occasionally clear.
"	"	10 "	23.060	82.	82.	694.7	595.5	..	..

Date.	Station.	Time.	Barm.	Attached. Therm.	Detached Therm.	Wcollast new.	Wcollast. old.	Barm. Height.	Therm. Height.	Remarks.
July 24	Ghuznee, ...	11 A.M.	23.042	83.	83.	..	..	..	..	E. N. E. gusts, occasionally [clear.
"	"	12 "	23.042	84.	84.	..	..	..	..	Ditto, but steadier.
"	"	1 "	23.039	87.	87.	..	..	..	..	Ditto ditto.
"	"	2 "	23.012	87.	87.	..	..	..	..	Calm.
"	"	3 "	23.000	88.	88.	694.5	593.3	..	..	Calmish, or slight N. E. wind.
"	"	4 "	22.976	89.	89.	695.	596	..	..	Calm, clear.
25	"	10 "	23.100	83.	83.	..	..	..	..	Rather cloudy.
"	"	11 "	23.092	85.	85.	..	..	..	..	Calm.
"	"	12 "	23.093	87.5	87.5	..	..	..	..	Calm, clear.
"	"	1 "	23.060	88.5	88.5	..	..	..	..	Mean of all Observation. Barm. 23.035 New Wool. 694.5 Old ditto. 594.5 Therm. ... 80.0
"	"	2 "	23.060	90.	90.	..	..	..	..	Slight S. W. wind.
"	"	3 "	23.042	89.	89.	693.1	593.9	..	..	Calm, clear, close.
"	"	4 "	23.033	89.	89.	..	..	..	new.	Ditto ditto,
"	"	"	"	"	"	694.9	594.8	772.6	7717	Ditto ditto..
26	"	10 "	23.058	83.	83.	..	..	..	old.	S. W. wind.
"	"	11 "	23.052	86.	86.	..	..	..	7665	Ditto ditto.
"	"	12 "	23.038	89.	89.	..	..	..	mean.	Calm, S. W. wind, slight, and light squall from S. E. 9, 10 P. M.
"	"	2 "	23.000	90.	90.	..	..	..	7691	
"	"	3 "	22.996	90.	90.	..	..	..	..
"	"	4 "	22.996	91.	91.	692.9	592.3	..	..

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
July 27	Ghuznee, ..	10 A.M.	23.097	78.	78.	696.	595.	..	..	Much thunder. In a Mosque.
"	"	11 "	23.086	76.	76.	..	..	..	..	Calm, clear.
"	"	12 "	23.080	76.	76.	..	..	..	..	Ditto ditto.
"	"	1 "	23.060	76.	76.	..	..	..	..
"	"	2 "	23.043	76.	76.	..	..	..	..	Somewhat cloudy, heavy rain
"	"	3 "	23.026	76.	76.	..	..	..	..	with thunder, strong gusts,
										varying direction from 9 to
										10 P. M.
" 28	"	4 "	23.005	76.	76.	694.	594.1	..	..	Calm, clear, cloudy to E.
"	"	10 "	23.085	76.	76.	696.1	596.3	..	..
"	"	11 "	23.072	76.	76.	..	..	..	..
"	"	12 "	23.050	76.	76.	..	..	..	..	Cloudy.
"	"	1 "	23.034	76.	76.	..	..	..	..	Ditto.
"	"	2 "	23.015	..	76.	..	..	..	..	Partially cloudy, calm.
"	"	3 "	23.007	..	76.	..	..	..	..	Threatening E. N. E. no rain
"	"	4 "	23.005	76.	76.	693.7	594.7	..	..	although cloudy till morn- [ing.
" 29	"	10½ "	23.070	76.	76.	..	..	..	..	Clear, calm.
"	"	11 "	23.055	76.	76.	..	..	..	..	Ditto ditto.
"	"	12 "	23.038	76.	76.	..	..	..	..	Ditto ditto.
"	"	1 "	23.022	76.	76.	..	..	..	..
"	"	2 "	23.004	76.	76.	..	..	..	..
"	"	3 "	22.990	76.	76.	..	..	..	..	Ditto S. W. wind strong, hazy.

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	Woolast. new.	Woolast. old.	Bar.	Height.	Therm. Height.	Remarks.
July 29	Ghuznee, ..	4 A.M.	22.985	76.	76.	..	..	..	..	..	Violent S. W. wind, dust.
" 30	Shushgoa,...	1 1/2 "	22.323	85.	85.	685.9	584.2	..	..	..	Ditto ditto 686.1.
" "	" "	2 "	22.315	86.	86.	..	..	..	..	..	Ditto ditto 584.1.
" "	" "	3 "	22.297	85.	85.	..	..	..	..	new.	Wind somewhat less violent, reset to obviate mistakes, wind continues, but less.
" "	" "	4 "	22.243	84.	84.	686.4	584.1	8697	8711	8711	Calm, clear. Therm. 46.3 p. m.
" "	" "	4 1/4 "	22.298	84.	84.	..	..	..	old.	8768	
" "	" "	5 "	22.287	83.	83.	..	..	..	mean.	8739	
" 31	Huftasya, ..	11 "	22.533	81.	81.	688.4	588.2	..	..	..
" "	" "	12 "	22.527	85.	85.	..	..	..	..	42	
" "	" "	1 "	22.524	85.	85.	..	..	B. 8420	..	feet. excess.	Calm.
" "	" "	2 "	22.515	85.	85.	..	..	..	old.	8460	S. W. wind getting up. [onally.]
" "	" "	3 "	22.500	86.	86.	687.8	585.6	..	..	8485	S. S. W. wind, strong occasionally.
" "	" "	1 "	23.168	91.	91.	694.5	595.4	..	..	..	Ditto ditto very clear.
Aug. 1	Hyderkhet, ..	2 "	23.160	92.	92.	..	..	7637	new.	7687	S. S. wind getting up, blows [down valley.]

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 1	Hyderkhet.	2½ AM.	23.145	95.	95.	695.1	694.6	..	old.	Calmish.
" "	"	3 "	23.145	93.	93.	696.1	59.7	..	7657	Dust, S. wind.
" 2	Shaikabad.	1 "	23.362	95.	95.	697.7	597.8	..	new.	Calm sultry { Means, 23.312
" 3	"	10 "	23.350	87.	87.	697.7	597.8	..	7468	Calm, clear, Therm. 93.6
" "	"	11 "	23.350	91.	91.	..	..	7473	old.	Ditto ditto, { New,... 696.7
" "	"	12 "	23.336	91.	91.	..	..	..	7428	Ditto ditto, { Old,... 596.8
" "	"	2 PM.	23.266	93.	93.	..	..	..	..	W. N. W. wind strongish.
" "	"	3 "	23.262	95.	95.	696.3	595.7	..	..	Ditto ditto ditto.
" "	"	4 "	23.255	94.	94.	696.3	595.7	..	..	Very strong wind.
" 4	Kilsah Sir..	11½ "	22.830	89.	89.	691.4	590.4	..	new.	Occasional S. S. W. gust, clear elastic.
" "	Mahomed,...	12 "	22.820	89.	89.	..	..	8051	82.31	Means, 22.837
" "	"	2 "	22.860	91.	91.	..	..	..	..	Therm... 89.7
" "	"	4 "	..	90.	90.	689.7	588.4	..	..	Ditto { New,... 690.5
" "	"	11 "	23.110	87.	87.	694.9	594.6	..	..	Old, 589.4
" 5	"	12 "	23.080	89.	89.	..	..	7747	..	Occasional gusts, small whirlwinds.
" "	"	12 "	23.080	89.	89.	..	..	..	..	Common scattered clouds, calm, clear.
" "	"	12 "	23.080	89.	89.	..	..	..	..	Cloudy, close, or S. breezes.

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Bar. Height.	Therm. Height.	Remarks.
Aug. 5	Mahomed.	1 A.M.	23.667	89.	89.	693.9	593.1	4 P.M.	..	N. N. E. wind, threatening
"	"	3 "	23.040	86.	86.	691.9	593.8	..	..	Very windy N. N. E. [night.
" 6	Urgunda.	11 "	23.089	..	..	..	..	..	..	N. N. E. wind.
"	"	12 "	23.081	..	..	..	..	..	..	Ditto do. gusts, rather cloudy.
"	"	1 "	23.081	..	..	..	..	7628	..	Ditto ditto, strong wind.
"	"	3 "	23.034	..	..	693.4	591.4	..	..	Heavy clouds to N. with thunder storm, rain also towards morning.
" 7	Kilah.	12 P.M.	24.071	100.	100.	704.8	606.8	..	..	Calm, sultry, cloudy to N.
"	Kazie.	1 "	24.071	..	..	4 P.M.	4 P.M.	..	..	Cloudy E. windy, light.
"	"	2 "	24.069	..	..	703.3	605.	..	..	Very strong wind 4 P. M. calm, very close, cloudy, all night [close.
" 8	"	10 "	24.112	..	..	706.4	606.4	..	..	Calm, sultry.
"	"	11 "	24.108	..	..	..	..	..	..	Ditto, very hot.
"	"	12 "	24.097	..	..	..	..	..	..	Ditto ditto, cloudy to N.
"	"	1 "	24.080	..	..	..	..	..	..	Ditto ditto, overcast.
"	"	2 "	24.070	..	..	..	..	6508	..	Ditto, cloudy.
"	"	3 "	24.025	..	..	..	..	..	..	Threatening rain.
"	"	4 "	24.016	..	..	705.1	606.4	..	..	Ditto ditto.
" 9	"	10 "	24.073	..	..	704.2	606.1	..	..	Close, calm, hazy.
"	"	11 "	24.060	..	..	..	..	..	..	Calm, close.
"	"	12 "	24.048	..	..	..	..	..	..	N. E. wind slight.
"	"	1 "	24.020	..	..	..	..	..	..	Ditto ditto.
"	"	2 "	24.008	..	..	..	..	..	..

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 9	Kazie, ..	3 PM.	23.968	..	..	5 PM.	5 PM.	..	..	N. E. wind slight.
" 10	Baber's Tomb, ..	4 "	23.948	..	..	702.4	603.4	..	..	Violent winds from N. W.
" 11	Cabul, ..	10 "	24.187	75.	75.	704.6	605.8	..	..	Clear, calmish. [bearing.
" "	Baber's Tomb, ..	11 "	24.183	..	..	..	..	..	..	Ditto ditto.
" "	..	12 "	24.183	..	..	..	..	..	..	..
" "	..	1 "	24.068	80.	80.	..	..	..	..	..
" "	..	2 "	24.054	..	..	..	..	6396	..	..
" "	..	3 "	24.140	..	..	..	..	..	..	..
" "	Baber's Tomb, ..	4 "	24.125	91.	91.	703.8	605.4	..	..	Slight breezes clear, clear night.
" 12	..	10 "	24.140	75.	75.	..	..	..	..	Slight cool breezes, clear.
" "	..	12 "	24.124	..	..	..	..	..	..	Clear.
" "	..	4 "	24.040	85.	85.	..	..	..	..	Ditto.
" 13	..	8 "	24.158	63.	63.	..	..	..	..	Br. summit of ridges on which wall built 23.111. Therm. 60.7 $\frac{1}{2}$ A. M.
" "	..	9 "	24.158	..	..	..	..	..	..	Cool breezes, clear.
" "	..	11 "	24.158	..	..	..	..	..	..	..
" "	..	12 "	24.161	85.	85.	..	..	..	..	..
" "	..	1 "	24.161	..	..	..	..	..	..	[at evening.
" "	..	2 "	24.145	..	..	..	..	..	..	High wind from N. as usual
" "	..	3 "	24.116	..	..	..	..	..	..	Clear fine, 13 fine night.
" 16	..	10 "	24.200	75.	75.	..	..	..	..	Ditto ditto.
" "	..	11 "	24.190	75.	75.	..	..	..	..	Ditto ditto.
" "	..	12 "	24.176	76.	76.	..	..	..	..	Ditto ditto.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 16	Baber's Tomb,	1 P.M.	24.163	79.	79.	..	..	..	..	Clear, fine.
"	"	2 "	24.135	85.	85.	..	..	..	..	Ditto ditto.
"	"	3 "	24.115	83.	83.	..	..	..	..	Ditto ditto.
"	"	4 "	24.100	82.	82.	..	..	..	..	Clear.
" 21	"	12 "	24.223	80.	80.	..	..	..	..	Ditto.
"	"	1 "	24.187	84.	84.	..	..	..	..	Ditto.
"	"	2 "	24.172	86.	86.	..	..	..	..	Clear, or broken tube 25.235.
"	"	4 "	24.135	86.	86.	..	..	..	..	Misty, rain last evening.
" 25	1 Pass, ..	8 "	22.148	60.	60.	..	..	8670	..	..
"	Sufaid Sum-	"	"	"	"	"	"	"	"	Hazy.
"	mut, ..	12 "	23.002	68.	68.	..	..	..	..	Clouds with sunshine.
"	Khake Kote,	1 "	22.970	74.	74.	692.6	591.8	..	..	Cloudy, threatening to East.
"	Ashruf, ..	2 "	22.964	75.	75.	..	..	7749	..	Threatening from W. thun-
"	"	2½ "	22.935	70.	70.	..	..	..	..	der, heavy storm from W.
"	"	"	"	"	"	"	"	"	"	Hazy and close, rainy yester-
" 27	Siri, ..	5¼ "	22.132	75.	75.	..	..	8836	..	[day.
"	Chushor, ..	6¼ "	22.123	70.	70.	..	..	..	..	Cloudy.
"	Top of Oon-	"	"	"	"	"	"	"	"	Occasional gusts of wind, clear.
" 28	noo Pass,	10 "	20.365	80.	80.	664.1	559.2	11320	..	Occasional gusts of cold brack-
"	Yonutt, ..	2 "	20.850	70.	70.	..	..	..	..	[ing wind.
"	"	3 "	20.830	74.	74.	..	..	10618	..	Occasional gusts, W. N.W.
"	"	4 "	20.830	73.	73.	669.2	564.8	..	..	wind clear.
"	"	"	"	"	"	"	"	"	"	Ditto ditto.
"	"	4½ "	20.830	71.	71.	..	..	..	..	..

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Aug. 29	Yonutt, ..	10 AM.	20.844	66.	66.	668.9	564.6	..	..	Strongish W. wind. Therm. 46° 6 P.M.
"	"	11 "	20.832	68.	68.	..	..	..	..	Clear, bracing strong wind.
"	"	12 "	20.826	73.	73.	..	..	..	..	Ditto ditto, hazy.
"	"	1 "	20.821	74.	74.	..	..	..	..	Wind strong, hazy, broken
30	Helmund, ..	8 "	22.206	63.	63.	..	..	100.76	..	[tube 21.947.
"	Sea Sung, ..	2 PM.	20.934	69.	69.	670.6	565.4	..	..	Wind strong down ravine, clear.
"	"	3 "	20.925	68.	68.	..	..	104.88	..	Ditto ditto, clear.
"	"	4 PM.	20.920	67.	67.	..	..	..	..	Ditto ditto ditto.
31	Top of Ascent.	10½ AM.	20.320	80.	80.	..	..	113.70	..	Sheltered.
"	Hajuguk, ..	4½ "	19.755	80.	80.	656.8	548.3	121.90	..	E. N. E. wind rather sheltered.
"	Top of do Halt.	1¼ PM.	20.660	70.	70.	..	..	..	..
"	"	2¼ "	20.648	67.	67.	..	..	..	..
"	"	3¼ PM.	20.658	65.	65.	668.1	562.4	108.83	..	
"	Rullo, ..	4 "	20.658	65.	65.	..	..	..	..	Clouds near Koh-i-Baba.
"	"	5 "	20.664	62.	62.	..	..	..	..	Temp. of spring 4 P. M. 45°.
"	"	"	"	"	"	"	"	"	"	(Major Thomson.)
Sept. 1	Kulloo Karood	1½ "	21.424	76.	76.	..	..	..	..	Clear, calm. Therm. 30.6
"	or Sokhtah,	2½ "	21.413	76.	76.	674.8	571.5	983.9	..	[A. M.
"	"	4 "	21.411	66.	66.	..	..	..	..	Rather cloudy, clear night,
"	"	"	"	"	"	"	"	"	"	Therm. 34° 6 A. M.
2	Kaloo Pass	11 AM.	19.532	66.	66.	651.9	545.1	..	..	Slight northerly wind, clear.
"	Summit, ..	11½ "	19.506	67.	67.	..	..	124.81	..	

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
Sept. 2	Topchie, ..	4 P.M.	21.995	75.	75.	681.	578.1	..	..	Cloudy, Ther. 50° 5 A. M. *
" "	" "	5 "	21.990	71.	71.	..	..	90.85	..	Cloudy, threatening, close.
" 3	Bamean, ..	2 P.M.	23.380	77.	77.	685.2	584.	..	..	Occasional gusts from Koh-i-
" "	" "	3 "	22.380	73.	73.	..	..	..	..	[106°
" "	" "	4 "	22.376	73.	73.	..	..	..	..	Baba. On carpet in sunshine
" "	" "	9 1/2 A.M.	22.511	60.	60.	685.5	585.9	..	..	Squally. Clear, serene.
" 4	" "	10 "	22.511	62.	62.	..	..	..	..	Ditto.
" "	" "	11 "	22.490	66.	66.	..	..	..	..	Close, sultry.
" "	" "	12 "	22.460	75.	75.	..	..	..	..	Ditto ditto. [W.
" "	" "	2 P.M.	22.430	80.	80.	686.1	584.5	..	..	Cool breezes from S. or S. S.
" "	" "	2 1/2 "	22.428	78.	78.	..	..	8496	..	[A. M.
" "	" "	10 A.M.	22.456	63.	63.	685.8	586.	..	..	Calm, clear, Therm. 28° 30° 6
" 5	" "	11 "	22.440	70.	70.	..	..	..	..	Ditto in sun 100° (hottest)
" "	" "	" "	" "	" "	" "	" "	" "	" "	" "	part of day.
" "	" "	12 "	22.429	76.	76.	..	..	..	..	Ditto.
" "	" "	1 P.M.	22.407	76.	76.	..	..	..	..	Ditto.
" 6	Nohawk, ..	1 "	22.720	75.	75.	..	..	..	..	Calm, clear.
" "	" "	2 "	22.685	76.	76.	..	..	8186	..	Ditto. [Pass.
" 7	Kotul, ..	9 A.M.	21.937	69.	69.	..	..	9155	..	Clear, 50 ft. below Summit of
" "	" "	1 P.M.	22.129	75.	75.	682.	580.9	..	..	[Ravine.
" "	" "	2 "	22.125	76.	76.	..	..	8914	..	Clear, occasional gusts down

* From this the calculations for the height indicated by the two Woollast Thermometers, it will be seen are discontinued. There is ample evidence to shew how accurate their indications generally are.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Sept. 8	Halt high up	12½ PM.	20.180	62.	62.	..	..	..	..	Flying clouds.
"	Erak Ravine,	1 "	20.164	61.	61.	661.	555.3	..	..	Ditto ditto.
"	"	3½ "	20.147	58.	58.	..	..	11.545	..	Cloudy.
"	"	3½ "	20.135	59.	59.	..	..	..	..	Partial clouds.
"	Summit of	9 A.M.	19.190	56.	56.	..	..	..	..
"	Erak Pass,	9¼ "	19.236	60.	60.	648.5	539.1	12.909	..	Slight hail, sunshine & clouds.
"	Kurzar.	1½ PM.	20.585	51.	51.	666.8	560.1	..	..
"	"	2 "	20.567	56.	56.	..	..	10.939	..	Sunshine and clouds. Therm.
"	"	"	"	"	"	"	"	"	"	6 A. M. 31°.
"	Helmund Gir-	2 "	21.215	67.5	67.5	673.6	568.3	10.076	..	At 1 P.M. violent squall from
"	dun Dewar,	3 "	21.207	61.5	61.5	..	..	..	..	Threatening. [East.
"	Ravine, ..	6 "	20.884	55.	55.	670.3	565.	10.522	..	Slight rain, threatening.
"	Sir-i-	2½ "	22.199	69.	69.	684.	582.	..	..	Clouds and sunshine with oc-
"	Chushm, ..	3 "	22.185	68.	68.	..	..	883.6	..	casional breezes.
"	"	4 "	22.201	66.	66.	..	..	..	..
"	Jubraiz, ..	10¼ AM.	22.791	68.	68.	689.2	588.9	..	..	Easterly breezes, very clear.
"	"	11 "	22.763	70.	70.	..	..	..	..	Ditto.
"	"	12 "	22.760	75.	75.	..	..	..	..	Calm, hot.
"	"	1½ PM.	22.749	79.	79.	..	..	808.2	..	Ditto ditto.
"	"	2 "	22.749	78.	78.	..	..	..	..	Easterly breezes.
"	"	2½ "	22.749	77.5	77.5	..	..	..	..	Ditto.
"	"	12½ "	23.109	82.	82.	694.4	594.9	..	..	Cloudy.
"	Kote-i-Ashruf,	12½ "	"	"	"	..	..	774.9	..	Ditto.
"	"	1 "	23.081	82.	82.	..	..	..	..	Sudden dry squall from W.
"	"	2 "	23.048	78.	78.	..	..	..	..

Date.	Station.	Time.	Barom.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barom. Height.	Therm. Height.	Remarks.
Sept. 15	Khak-i-Sofaid Pass,	7½ A.	22.376	67.	67.	68.3.3	582.6	5670	..	Fine, clear.
"	Urghundi,...	11 "	23.265	75.	75.	..	..	..	..	Fine, clear.
"	"	12 "	23.260	80.	80.	..	..	..	..	Cloudy, E. breezes.
"	"	1 P.M.	23.235	79.	79.	692.7	594.	..	..	Sunshine and cloudy.
"	"	2 "	23.224	79.	79.	..	..	7628	..	Ditto do. strongish E. breezes.
"	"	3 "	23.192	74.	74.	692.7	592.5	..	..	Ditto ditto.
"	"	4 "	23.186	73.	73.	..	..	..	..	Ditto ditto.
"	"	5 "	23.184	72.	72.	..	..	..	..	Cloudy ditto ditto.
"	Baber's Pillar,...	10½ A.	22.434	62.	62.	683.5	581.5	..	..	Cloudy ditto ditto.
Oct. 1*	Cabul, ..	11 "	24.322	73.	73.	..	..	..	..	Calm, clear.
"	Newcamp to	12 "	24.310	75.	75.	..	..	..	..	Ditto.
"	C. of Town,	1 P.M.	24.290	75.	75.	..	..	..	..	Ditto.
"	"	2 "	24.257	78.	78.	..	..	..	..	Ditto.
"	"	3 "	24.245	78.	78.	..	..	..	..	Ditto.
"	"	4 "	24.234	78.	78.	..	..	..	..	Ditto. Therm. 114° in sun.
"	"	5½ "	24.238	75.	75.	..	..	..	..	Ditto.
"	"	10 A.M.	24.347	72.	72.	..	..	..	..	Calm, clear.
2	"	11 "	24.325	75.	75.	..	..	..	..	Ditto.
"	"	12 "	24.316	77.	77.	..	..	..	..	Ditto ditto, strong winds.
"	"	1 P.M.	24.314	77.	77.	..	..	..	..	Ditto ditto at 7 P. M.
"	"	2 "	24.300	78.	78.	..	..	..	..	Ditto ditto from the North.

* From this period the cistern obtained with the instrument was not continued in use, but a wooden cup was substituted in its place.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 2	New camp to	3 P. M.	24.283	79.	79.	..	..	..	..	Calm, clear from the North.
" 3	C. of Town,	4 "	24.283	77.	77.	..	..	..	..	Ditto ditto.
" "	"	10 A. M.	24.388	73.	73.	..	..	..	..	Calm, clear.
" "	"	11 "	24.388	75.	75.	..	..	..	..
" "	"	12 "	24.380	76.	76.	..	..	..	..
" "	"	1 P. M.	24.340	78.	78.	..	..	..	..	Northerly breezes.
" "	"	2 "	24.340	78.	78.	..	..	..	..	Ditto. } Strong at 8, and 9
" "	"	3 "	24.316	76.	76.	..	..	..	..	Ditto. } P. M.
" "	"	4 "	24.307	75.	75.	..	..	..	..	Calm, clear.
5	"	10 A. M.	24.333	70.	70.	..	..	..	..	Ditto.
" "	"	11 "	24.326	70.	70.	..	..	..	..	Ditto.
" "	"	12 "	24.320	73.	73.	..	..	..	..	Ditto.
" "	"	2 P. M.	24.280	74.	74.	..	..	..	..	Ditto.
" "	"	3 "	24.263	74.	74.	..	..	..	..	Ditto.
" "	"	4 "	24.260	73.	73.	..	..	..	..	Ditto.
" "	"	11 A.	24.347	70.	70.	705.0	607.8	..	..	Calm, clear,
6	Boothkah,	12 "	24.302	70.	70.	..	..	..	..	Ditto.
" "	"	1 P. M.	24.274	71.	71.	..	..	6247	..	Small whirlwinds or
" "	"	2 "	24.274	71.	71.	..	..	..	..	devils very com-
" "	"	3 "	24.271	72.	72.	..	..	..	..	mon.
" "	"	12 "	23.293	64.	64.	695.1	596.	..	..	North winds in gusts.
7	Khoud, ..	1 "	23.280	64.	64.	..	..	7466	..	Ditto.
" "	"	2 "	23.272	64.	64.	..	..	..	..	Ditto.
" "	"	3 "	23.260	66.	66.	694.9	595.3	..	..	Ditto.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 8	Tarzeen, ..	1 PM.	24.053	70.	70.	702.5	605.	..	..	Clear, fine.
"	"	2 "	24.066	69.	69.	..	..	..	..	Ditto.
"	"	3 "	24.062	69.	69.	..	..	6488	..	Ditto.
"	"	4 "	24.054	68.	68.	702.5	605.1	..	..	Ditto.
"	"	10 AM.	24.066	66.	66.	..	..	..	..	Calmish, clear.
" 10	Barikab, ..	1½ PM.	25.120	78.	78.	..	..	..	..	Ditto.
"	"	2 "	25.125	78.5	78.5	713.5	617.5	..	..	Ditto.
"	"	3 "	25.113	78.	78.	..	..	5313	..	Ditto.
"	"	4 "	25.098	78.	78.	713.8	616.5	..	..	Sunset below hills.
"	"	4½ "	25.086	72.	72.	..	..	..	..	Calmish, clear.
" 11	Jugdulluk, ..	1¼ "	25.040	74.	74.	..	..	..	..	Ditto.
"	"	2 "	25.042	74.	74.	..	..	..	..	Cloudy, S. horizon heavy.
"	"	4 "	24.960	73.	73.	712.3	615.3	5375	..	Clear, calm.
" 12	"	10 AM.	25.130	61.	61.	712.	616.6	..	..	Ditto.
"	"	11 "	25.100	63.	63.	..	..	..	..	Calm, clearish.
" 13	Soukhab, ..	1 PM.	25.921	82.	82.	720.8	625.9	4373	..	Ditto.
"	"	2 "	25.907	81.	81.	..	..	..	..	Clouds to E. S. E.
"	"	3 "	25.907	81.	81.	..	..	..	..	Clear, calm.
" 14	Gundumuk	12 "	25.746	74.	74.	..	..	..	..
"	"	1 PM.	25.702	76.	76.	..	..	..	..
"	"	2 "	25.702	76.	76.	..	..	..	..
"	"	2½ "	25.696	76.	76.	720.	625.6	4616	..	
" 15	"	10 AM.	25.683	72.	72.	718.8	623.3	..	..
"	"	11 "	25.670	72.	72.	..	..	..	..	Rather cloudy and close.

Date.	Station.	Time.	Bar.	Attached. Therm.	Detached. Therm.	Woollast. new.	Woollast. old.	Bar.	Therm. Height.	Remarks.
Oct. 15	Gundumuk,	12	25.660	70.	70.	718.5	623.5			Overcast, snowy on Sofaid Koh.
" 16	Futtehabad,	12½ PM.	27.058	80.	86.	"	"			Clear, calm.
" "	"	1	27.046	78.	85.	"	"			Ditto ditto.
" "	"	2	27.035	79.	86.5	"	"			Ditto ditto.
" "	"	2½	27.020	88.	88.	731.9	638.			Ditto ditto, close.
" "	"	3	27.020	77.	87.	"	"			Ditto ditto.
" "	"	4½	27.020	74.	82.	"	"			Ditto ditto.
" 17*	"	10 AM.	27.140	76.	81.	"	"			Calm, close, clear.
" "	"	10½	27.140	76.	83.	732.4	638.2			Ditto ditto ditto.
" "	"	11	27.140	76.	83.	"	"	3098		[in sun 96°.
" "	"	12	27.106	76.	83.	"	"			Clear and light breezes, Therm.
" "	"	1 PM.	27.095	76.	85.	"	"			Ditto ditto.
" "	"	2	27.096	78.	84.	"	"			Ditto ditto.
" "	"	3	27.060	80.	84.	"	"			Ditto ditto.
" "	"	3½	27.030	77.	83.	731.	637.5			Ditto ditto.
" "	"	4	27.030	75.	81.	"	"			Ditto ditto.
" 19†	"	10½ AM.	27.187	70.	71.	732.	639.8			E. winds, very clear.
" "	"	11	27.180	71.	74.	"	"			Ditto ditto ditto.
" "	"	12	27.170	72.	75.5	"	"			Ditto ditto, Therm. 85° in sun.
" "	"	1 PM.	27.164	73.	78.	"	"			Ditto.
" "	"	2	27.164	75.	79.	"	"			Ditto.
" "	"	3	27.140	76.	81.	731.	639.			Strong E. wind.

* This is the first Pass between Tohawk and the Erak Valley.

† Barometer put up twice, 2d Observation most correct.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. *20	Sultanpore,	11 A.M.	27.963	76.	79.	739.8	647.5	..	..	Calm, close, sultry.
" "	"	12 "	27.946	76.	82.	..	..	..	..	Occasional gusts from W.
" "	"	1 "	27.920	76.5	84.	..	..	2286	..	Ditto ditto.
" "	"	2 "	27.882	78.	85.5	..	..	..	..	Ditto ditto.
" "	"	3 "	27.857	78.	85.5	738.8	646.5	..	..	Ditto ditto.
" "	"	12 "	28.205	79.	90.5	..	..	..	..	Clear, close, calm, 104° in sun.
21	Jelalabad.	1 P.M.	28.175	78.	92.	..	..	..	..	Ditto ditto, 106° in sun,
" "	"	2 "	28.114	80.	92.	..	..	..	..	Ditto ditto, 109° ditto.
" "	"	4 "	28.083	77.	90.	..	..	..	..	Ditto ditto, 96° ditto.
" "	"	10 A.M.	28.155	68.	74.	741.	649.	..	..	Ditto ditto, 44° sunrise.
" "	"	11 "	28.128	70.	76.	..	..	..	..	Ditto ditto.
" "	"	12 "	28.110	74.	80.	..	..	..	..	Ditto ditto.
" "	"	1 P.M.	28.083	77.	83.	739.5	648.3	..	..	Ditto ditto.
" "	"	2 "	28.040	79.	84.	..	..	..	..	Ditto ditto.
" "	"	2½ "	28.032	79.	85.	..	..	1964	..	Calm, overcast.
" "	"	10 A.M.	28.211	70.	73.	740.5	650.	..	..	Clear.
+23	"	11 "	28.220	69.	75.	..	..	..	..	Ditto, close.
" "	"	12 "	28.211	74.	81.	..	..	..	..	Ditto ditto.
" "	"	1 P.M.	28.198	77.	83.	..	..	..	..	Ditto ditto, 110° in sun.
" "	"	2 "	28.186	79.	85.	..	..	..	..	Calm, clear, 100° in ditto.
" "	"	3½ "	28.165	80.	85.	740.	650.	..	..
" "	"	10 "	28.347	74.	76.	742.	651.6	..	..

* F. Foot of ascent of the Onnurje Pass.

† Pass between Urghundi and the Meydan Valley.

‡ Bactrian Pillar on the range bounding the Cabul Valley to the S. S. E.

Date.	Station.	Time.	Bar.	Attached. Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 26	Jelalabad, ..	11 P.M.	28.320	76.	77.	..	..	..	..	Calm, clear, 112° in sun.
"	"	12 "	28.280	82.	86.	..	..	..	..	Ditto ditto, 120° ditto.
"	"	1 "	28.248	84.	87.5	742.	649.5	..	..	Ditto ditto, 109° ditto.
"	"	2 "	28.211	85.	88.5	..	..	..	..	Ditto ditto, 103° ditto.
"	"	3 "	28.190	84.	88.5	..	..	..	..	Ditto ditto, 92° ditto.
"	"	4 "	28.170	84.	87.	739.8	648.	..	..	Ditto ditto, 102° ditto.
27	Ali Bajhac, 10 ¹ / ₂	"	28.282	76.	82.5	..	651.	..	..	Overcast, calm.
"	"	11 "	28.270	74.	80.	741.3	..	..	..	Sunshine 96° 5" in sun.
"	"	12 "	28.248	80.	88.	..	..	1911	..	Ditto 110° in ditto.
"	"	1 "	28.225	82.	86.	..	..	..	..	Ditto 107° in ditto.
"	"	2 "	28.200	82.	86.5	..	..	..	..	Clouded, 92° in ditto.
"	"	3 "	28.190	81.	86.5	..	..	..	..	..
"	"	4 "	28.177	81.	85.	740.8	649.	..	..	Clouded, 90° in ditto.
28	Barikab near	12 "	28.366	80.	86.	742.5	653.	..	..	Clear, calm, 106° in sun.
"	Charduh, ..	1 "	28.343	81.	86.3	..	..	..	..	Ditto ditto, 104° in ditto.
"	"	2 "	28.320	83.	87.	..	..	1822	..	Ditto ditto, 96° in ditto.
"	"	3 "	28.305	84.	88.	..	..	..	..	Ditto ditto, 98° in ditto.
"	"	4 "	28.292	82.	88.	..	..	..	..	Ditto ditto, 102° in ditto.
"	Bussola, ..	11 ¹ / ₂ AM.	28.632	77.	84.	..	..	..	..	Ditto ditto, 105° in ditto.
29	"	12 "	28.631	77.	84.	..	..	1509	..	Slight earth quake 2 ¹ / ₂ P.M.
"	"	1 P.M.	28.606	79.	85.	745.	655.5	..	..	Ditto ditto, 108°.
"	"	2 "	28.596	80.	87.5	..	..	..	..	Ditto ditto, 111°.
30	Lalpore, ..	11 ¹ / ₂	28.753	80.	81.	..	..	..	..	Calm, clear.
"	"	12 "	28.753	80.	81.	..	..	..	..	Ditto ditto, 103° in sun.

Date.	Station.	Time.	Barm.	Therm. Attached	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Oct. 30	Lalpure, ..	1 P.M.	28.735	84.	85.	745.5	656.6	1404	.	Calm, clear, 111° in sun.
" "	" "	2 "	28.680	86.	87.	"	"	"	"	Ditto ditto, 104° in ditto.
" "	" "	3 P.M.	28.680	86.	86.5	"	"	"	"	Calm, clear, 108° in sun.
" 31	" "	10 A.M.	28.780	76.	73.	745.4	656.6	"	"	Calm, clear.
" "	" "	11 "	28.750	78.	78.5	"	"	"	"	Ditto ditto.
" "	" "	12 "	28.738	80.	83.	"	"	"	"	Ditto ditto.
" "	" "	1 P.M.	28.700	83.	84.5	"	"	"	"	Ditto ditto.
" "	" "	2 "	28.662	83.	85.	"	"	"	"	Ditto ditto.
" "	" "	2½ "	28.662	83.	86.	745.5	654.8	"	"	Ditto ditto.
" "	" "	11 "	27.697	75.	76.	"	"	"	"	Calm, clear.
Nov. 1	Landye, ..	11½ "	27.697	75.	76.	"	644.6	"	"	[W. wind.
" "	Khanal, ..	12 "	27.675	76.	76.	"	"	"	"	Very clear, Therm. 93° in sun
" "	" "	1 "	27.650	77.	78.	"	"	"	"	Ditto ditto ditto, 95° in do. do.
" "	" "	2 "	27.606	79.	80.	"	644.1	"	"	Ditto ditto ditto, 90° in do. do.
" 2	" "	10¼ A.M.	27.670	73.	76.	736.5	"	2488	"	Calm, very clear.
" "	" "	11 "	27.662	74.	76.5	"	"	"	"	Ditto ditto, 91°.
" "	" "	12 "	27.640	77.	80.	"	"	"	"	W. breeze, 90°.
" "	" "	1 P.M.	27.616	80.	83.	"	"	"	"	Ditto. 84°.
" "	" "	2 "	27.600	82.	86.	"	"	"	"	Ditto.
" "	" "	3 "	27.585	85.	86.	"	"	"	"	Ditto.
" 3	Summit, ..	8 A.M.	26.725	50.	50.	"	"	3373	"	Calm.
" "	Kyber Pass {	2½ P.M.	27.716	76.	78.5	"	"	"	"	Clear light, E. breezes.
" "	Ali Musjid, }	3 "	27.716	78.	80.5	735.	645.3	"	"	Ditto ditto occasionally.
" "	" "	3 "	27.716	78.	80.5	"	"	"	"	"

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Nov. 3	Kyber Pass Ali Musjid, }	4 P.M.	27.690	76.	75.	..	..	..	..	Cloudy to East.
" 4		5 "	27.690	73.	75.	..	..	..	..	Rather cloudy, E. wind.
" "		10 $\frac{1}{2}$ "	27.720	76.	77.6	736.8	646.	2433	..	Ditto ditto ditto.
" "		11 "	27.720	78.	81.5	..	..	..	..	Diffused clouds.
" "		12 "	27.705	79.	81.5	..	..	..	..	Ditto ditto.
" "		1 "	27.715	80.	82.5	..	..	..	..	Ditto ditto, calmish.
" "		2 "	27.638	80.	82.5	..	..	..	..	Clear, 99° in sun.
" 5		1 $\frac{1}{4}$ "	28.482	88.	91.5	743.4	654.2	..	..	Ditto 100° in ditto.
" "		2 "	28.440	88.	91.	..	..	..	..	Ditto 99° in ditto.
" "		3 "	28.440	86.	89.5	743.8	653.3	..	..	Calm, suffused clouds.
" "	Peshawur,	10 A.M.	28.937	76.	78.	746.5	657.5	1236	..	Ditto ditto ditto.
" "		11 "	28.906	74.	77.	..	..	..	..	Ditto ditto ditto.
" "		1 "	28.893	78.	81.5	..	..	..	..	Ditto ditto ditto.
" "		2 "	28.845	80.	82.	..	..	..	..	Ditto ditto ditto.
" "		3 "	28.869	84.	86.5	746.8	656.5	..	..	Ditto ditto ditto.
" "		12 "	29.113	82.	86.5	..	..	..	..	Calm, sultry.
" 7		1 P.M.	29.042	83.	88.5	..	..	..	..	Ditto ditto.
" "		2 "	29.042	86.	89.	..	..	..	..	Ditto ditto.
" "		3 "	29.028	85.	90.	..	..	..	..	Ditto ditto.
" 8		10 "	29.100	64.	65.	..	..	..	..	Suffused clouds.
" "	"	1 "	29.080	81.	86.	..	..	..	..	Ditto ditto.
" "		4 "	29.034	83.	88.	..	..	..	..	Overcast.
" "		12 "	29.102	63.	63.	..	..	..	..	Clouds and sunshine.
" 24		" "	" "	" "	" "	..	..	..	..	" "

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Bar. Height.	Therm. Height.	Remarks.
Nov. 24	Peshawur,	4 P.M.	29.068	65.	66.	..	..	..	..	Clouds and sunshine.
" "	Sunset,	..	29.045	64.	66.	..	..	..	..	Over east.
" "	Midnight,	..	29.016	63.8	64.5	..	..	..	..	Clearish.
" 25*	Sunrise,	..	29.051	58.	61.	..	..	..	..	Ditto.
" "	Noon,	..	29.067	63.	65.	..	..	..	..	Ditto.
" "	"	4 "	28.980	65.	66.	..	..	..	..	Fine.
" 26	"	2½ A.M.	29.034	63.	63.5	..	..	..	..	..
" "	"	8 "	29.040	58.	63.5	..	..	..	..	..
" "	Noon,	..	29.088	63.5	64.	..	..	..	..	..
" "	"	1¼ P.M.	29.060	65.	66.	..	..	..	..	Strong E. N. wind.
" "	"	2½ "	29.046	68.	67.5	..	..	..	..	..
" "	Sunset,	..	29.038	65.	66.	..	..	..	..	..
" 27	"	1½ A.M.	29.024	62.	63.5	..	..	..	..	..
" "	Sunrise,	..	29.030	58.	60.5	..	..	..	..	Clear, calm.
" "	Noon,	..	29.080	62.	62.5	..	..	..	..	..
" "	Sunset.	..	29.020	64.	65.	..	..	..	..	Clearish.
" 28	"	..	29.034	62.5	63.	..	..	..	..	Calm.
" "	Noon,	..	28.940	67.	67.	..	..	..	..	Ditto.
" "	Midnight,	..	29.030	63.5	64.	..	..	..	..	Ditto.
" 29	Sunrise,	..	29.034	57.5	57.	..	..	..	..	Very clear, calm.
" "	Noon,	..	29.066	61.	62.	..	..	..	..	Ditto.
" "	Sunset.	..	28.958	64.	65.	..	..	..	..	Ditto.

* Up to this I had only one Thermometer. A second having been procured, the detached Thermometer was customarily placed, about 3½ feet from the ground, generally on a table; the attached, on the ground near the cistern.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
Nov. 29	Midnight,	..	28.960	62.5	63.	..	..	..	..	Very clear, calm.
" 30	Sunrise, ..	..	28.975	57.5	57.	..	..	..	..	Calm, clear.
" "	Noon, ..	..	28.966	62.5	63.5	..	..	..	..
" "	" "	11 $\frac{1}{2}$ A.M.	28.977	69.	69.5	750.	..	..	..	Clear, N. E. wind getting up.
" "	Noon, ..	2 $\frac{1}{2}$ P.M.	28.895	62.5	63.5	..	660.5	..	..
" "	" "	4 "	28.875	70.5	71.	747.	657.	..	..
" "	Sunset, ..	..	28.870	67.5	68.	..	..	..	..
" "	Midnight, ..	..	28.912	64.	64.	..	..	..	..
Dec. 1	Sunrise, ..	..	28.915	54.	57.	..	..	..	..	Clear, calm.
" "	Noon, ..	..	28.997	61.5	62.	..	..	..	..	Ditto ditto.
" "	Sunset, ..	..	28.910	64.	65.5	..	..	..	..	Ditto ditto.
" 2	Sunrise, ..	..	29.020	53.	56.5	..	..	..	..	Clearish.
" "	Noon, ..	..	29.039	59.	60.	..	..	..	..
" "	4 Hour after Sunset, ..	..	29.011	61.	61.5	..	..	..	..	Cloudy.
" 3	Sunrise, ..	..	29.020	55.5	57.5	..	..	..	..	Ditto.
" "	Noon, ..	..	29.090	58.	59.5	..	..	..	..	Ditto.
" "	Sunset, ..	..	29.010	60.	61.5	..	..	..	..	Threatening rain.
" 4	Sunrise, ..	..	29.095	54.	57.	..	..	..	..	Clear 51° in air.
" "	Noon, ..	..	29.100	59.5	60.	..	..	..	..	Ditto 96° ditto.
" "	Sunset, ..	..	29.030	61.	62.	..	..	..	..	Ditto 92° ditto.
" 5	Sunrise, ..	..	29.083	59.	57.	..	..	..	..	Ditto 45° ditto.
" "	Noon, ..	..	29.075	60.	60.5	..	..	..	..	Ditto 96° ditto.

Date.	Station.	Time.	Bar.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Bar. Height.	Therm. Height.	Remarks.
Dec. 5	$\frac{1}{2}$ Hour after Sunset,...	..	28.995	60.	60.5	..	..	..	..	Clear, 67° in air.
" "	Midnight ..	..	29.005	60.5	61.	..	..	..	..	Clear, calm, 51° in air.
" 6	Sunrise ..	..	28.960	55.5	57.5	746.	659.	..	..	Ditto ditto.
" "	" ..	10 A.M.	29.010	59.5	61.	748.3	657.5	..	..	Ditto ditto 90° ditto.
" "	Noon, ..	..	28.958	61.5	63.5	748.3	656.5	..	..	Ditto ditto 71° ditto.
" "	" ..	4 P.M.	28.900	64.	66.	748.3	..	..	..	Ditto ditto 71° ditto.
" "	Sunset, ..	..	28.887	64.	65.	..	..	..	..	Calm clear. Therm. in air 51°.
" 7	Peshawur, ..	..	..	..	..	..	..	..	..	Ditto ditto ditto 90°.
" "	Sunrise, ..	..	28.943	56.	59.	..	..	..	..	Ditto ditto ditto 71°.
" "	Noon, ..	..	28.986	60.	61.5	..	..	..	..	Ditto ditto ditto 46°.
" "	Sunset, ..	..	28.925	61.5	63.	..	..	..	..	Ditto ditto ditto 56°.
" 8	Sunrise, ..	..	28.942	54.	58.	..	..	..	..	Rather cloudy, ditto 45°.
" "	Sunset, ..	..	28.890	60.	60.5	..	..	..	..	Cloudy, ditto 70°.
" 9	" ..	2 A.M.	28.880	59.5	60.5	..	..	..	..	Clear, ditto 62°.
" "	Sunrise, ..	..	28.920	54.	57.5	747.5	658.5	..	..	Ditto, ditto 45°.
" "	" ..	10 "	28.966	56.	58.5	747.8	657.8	..	..	Ditto, ditto 70°.
" "	Noon, ..	..	28.966	59.	60.5	748.	657.6	..	..	Clear, ditto 62°.
" "	" ..	4 P.M.	28.923	61.	62.5	..	..	..	..	Ditto, ditto 45°.
" "	Sunset, ..	..	28.900	61.	61.5	..	..	..	..	Ditto, ditto 70°.
" 10	" ..	1 A.M.	28.900	58.5	59.5	..	..	..	..
" "	Sunrise, ..	..	28.920	52.	55.5	..	..	..	..
" "	Noon, ..	..	28.945	57.	58.	..	..	..	..
" "	" ..	1 P.M.	28.915	59.	59.5	..	..	..	..

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast new.	Woollast old.	Barm. Height.	Therm. Height.	Remarks.
Dec. 10	Sunset, ..	..	28.915	59.	59.5	..	..	..	..	Clear, Therm. 59°.
" 11	" ..	12 $\frac{1}{2}$ P.M.	28.958	59.	59.5	..	..	..	..	Clearish, calm, 44°.
" "	Sunrise, ..	..	28.990	50.	53.	..	..	..	..	Ditto ditto 95°.
" "	Noon, ..	..	29.032	57.5	58.	..	..	..	..	Ditto ditto 59°.
" "	Sunset, ..	..	28.990	59.	59.5	..	..	..	..	Clear and calmish.
1840.										
Jan. 12	Shaiwa, ..	1 P.M.	28.235	61.	69.	..	..	..	..	Ditto ditto.
" "	" ..	3 "	28.211	62.	72.	..	..	..	..	Very cloudy.
" "	Pushut, ..	2 "	27.620	50.	51.	..	..	..	..	Cloudy.
" "	Camp, ..	4 "	27.610	49.	51.	..	..	..	..	Moderate N.E. wind, very fine.
" 30	Pushut Fort, ..	10 A.M.	27.544	49.	51.	..	..	..	..	Very fine, calmish.
Feb. 2	" ..	10 "	27.617	46.5	48.5	..	..	..	..	Ditto ditto.
" "	" ..	12 "	27.613	55.	56.5	..	..	..	..	Ditto ditto.
" "	" ..	1 P.M.	27.607	57.	58.5	..	..	..	..	Ditto ditto.
" "	" ..	4 "	27.568	57.	58.5	..	..	..	..	Cloudy.
March	Chughan, ..	6 $\frac{1}{2}$ A.M.	27.417	57.	57.	..	..	..	..	Ditto.
" "	Paicen, ..	7 $\frac{1}{2}$ "	27.420	57.	57.	..	..	..	..	Partial clouds.
" 3	Chughur, ..	2 $\frac{1}{2}$ P.M.	27.258	65.	..	..	..	..	..
" "	Bala or ..	4 "	27.245	67.5	..	..	..	..	..
" 4	Olipore, ..	10 A.M.	27.258	61.5	..	..	..	..	..
" "	" ..	11 "	27.255	62.5	..	..	..	..	..
" "	" ..	12 "	27.245	63.	64.5	..	..	..	..
" 9	Loongurrie, ..	1 P.M.	24.758	85.	..	..	..	..	..	Fine.
" "	Koonur, ..	9 A.M.	27.800	58.5	..	..	..	..	..	Fine and clear.

Date.	Station.	Time.	Barm.	Attached Therm.	Detached Therm.	Woollast. new.	Woollast. old.	Barm. Height.	Therm. Height.	Remarks.
1840.										
March 29	Koonur. . .	10 A.M.	27.795	60.	..	..	..	..	..	Fine and clear.
" "	" "	11 "	27.795	61.	..	..	..	..	..	Ditto ditto.
April 12*	Bharowul,...	9 "	24.578	58.5	..	..	..	..	..	Cloudyish.
" "	" "	9 $\frac{1}{2}$ "	24.577	57.7	..	..	..	..	..	Hazy.
June 22	Khujjak, ..	10 "	25.472	89.	93.	..	..	..	..	Calm, sultry.
" "	" "	12 "	25.431	91.	95.	..	..	..	..	Clear, slight N. E. breeze.
" "	" "	1 "	25.418	94.	99.	..	..	..	..
" "	" "	4 "	25.530	95.	98.	..	..	..	..
1841.										
Aug. 26†	Koh-i-Baba,	1 $\frac{1}{2}$ P.M.	17.356	79.5	85.	..	..	..	..	W. E. W. breezes, clear.
" "	" "	2 "	17.354	79.5	85.	..	..	..	..	Ditto ditto.
" "	Lower Station, ..	4 "	18.889	63.	68.	..	..	..	..	Ditto ditto.
" "	Kulsoo, ..	6 20'	20.716	58.5	60.	..	..	..	..	Ditto ditto.
Sept. 13†	Akrobat, ..	1 $\frac{1}{2}$ "	20.970	72.	73.5	..	..	..	..	Strong W. wind, very clear.
" "	" "	2 "	20.972	72.	73.5	..	..	..	..

* A village to the W. of Olipore on the mountains, and near Bharowul, both being about the inferior limit of the Deodar.

† These observations are for the height of the Eastern end of Koh-i Baba; the peaks were estimated (by the eye) as 1000 or 1500 feet above the upper station. All the Observations were made in the open air and in sunshine: the attached Thermometer placed inside the eistem, the detached hung five feet from the ground.

Date.	Time.	Bar.	Attached Therm.	Detached Therm.	Wet bulb.	Remarks.	
Dec. 21	7 A. M.	29.044	52.	54.5	50.	Calm, clearish, Therm. in open air,	45°
"	8 "	29.056	46.	50.	46.5	Ditto ditto, room opened ditto ditto,	48°
"	9 "	29.078	47.	50.5	46.5	Ditto ditto,	67.6
"	10 "	29.100	48.	50.	46.5	Ditto ditto,	79.5
"	11 "	29.080	51.	52.5	49.	Ditto ditto,	81.5
"	12 "	29.071	53.	53.5	49.	Ditto ditto,	87.
"	1 P. M.	29.060	54.	55.5	51.	Ditto ditto,	85.5
"	2 "	29.054	55.5	56.5	51.	Ditto ditto,	80.5
"	3 "	29.047	55.5	56.5	52.5	Ditto ditto,	75°
"	4 "	29.037	56.5	57.	52.5	Ditto ditto,	
"	5 "	29.030	56.	57.5	53.	Ditto ditto,	62°
"	6 "	29.030	56.	57.5	53.	Ditto ditto,	62°
"	7 "	29.022	55.	56.	52.	Ditto ditto, bright moon light,	57°
"	8 "	29.030	55.	56.	52.	Ditto ditto,	55°
"	9 "	29.028	55.	56.5	52.	Ditto ditto,	
"	10 "	29.030	54.5	56.5	52.	Ditto ditto,	
"	12 "	29.015	54.	55.5	51.	Ditto ditto,	44.5
"	1 A. M.	29.018	54.	55.5	51.	Ditto surface of Mercury very flat.	
"	2 "	29.000	53.5	55.5	51.	Ditto.	
"	3 "	29.000	53.5	55.5	51.	Ditto.	
"	4 "	29.000	53.5	55.5	51.	Ditto.	
"	5 "	29.000	53.	53.5	50.	Ditto.	
"	6 1/2 "	28.992	51.	54.	49.5	Ditto room opened,	35°

Attempts at Horary Observations of the Barometer and Wet Bulb, Peshawur, December 21, 22, 1840.—(continued.)

Date.	Time.	Barom.	Attached Therm.	Detached Therm.	Wet bulb.	Remarks.
Dec. 22	8 A. M.	29.980	44.	49.5	45.5	Calm, room opened, 85°
"	9 "	29.020	47.	50.5	46.	Ditto surface very convex. 68°
"	10 "	29.030	49.	52.5	49.	Ditto. 68°
"	11 "	29.025	52.	52.5	49.	Ditto. 83°
"	12 "	29.007	53.	54.5	51.	Ditto. 83°
"	1 P. M.	29.000	54.	56.5	53.	Ditto. 83°
"	2 "	28.986	55.5	57.	53.	Ditto. 62°
"	3 "	28.960	56.	58.	53.	Throughout no change in aspect of sky, uniformly clear above, more or less hazy round the horizon.
"	4 "	28.955	57.	59.	54.	Slightly 10 to S.S.E., S.W., very much so along Snowy Range or to W. N. W. to N. E.
"	5 "	28.955	56.5	59.	54.	it opened into a spacious verandah; throughout the night it was shut.

The room had one door open, and that to the westward; it opened into a spacious verandah; throughout the night it was shut.

The instruments were placed almost opposite the door. The Detached Thermometer hung from the wall $3\frac{1}{2}$ feet from the floor. The attached Thermometer was placed in the Cistern.

The wet bulb was an ordinary coarse Thermometer, divisions of 2° each; metal scale; *bulb not naked*.

The Thermometer in the open air was an indifferent one, it was hung upon the top of the house, 4 feet from its terraced roof.

The time was ascertained on the 21 by altitudes of the Sun, and on the 22 by equal altitudes. The time was calculated as within 5 of the apparent time for noon each day, as given in the Nautical Almanack.

CANDAHAR.

Observations of the Wet and Dry Bulb Thermometers.

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
1840.				
May 22	10 A. M.	76.5	62.	Clear.
" "	11 "	76.5	62.	Southerly wind.
" "	12 "	78.	62.	Moderate.
" "	1 $\frac{1}{2}$ P. M.	79. $\frac{1}{2}$	62.	Ditto.
" 23	10 A. M.	75.	59.5	Clear, moderate.
" "	11 "	76.5	59.5	Southerly wind.
" "	12 "	79.5	59.5	Ditto.
" "	1 P. M.	81.	59.5	Ditto.
" "	2 "	82.	59.5	Ditto.
" "	4 "	82.	59.5	Ditto.
" "	6 "	82.	59.5	Ditto.
" 24	8 A. M.	74.5	60.	Calm, clear.
" "	10 "	76.	59.5	Ditto.
" "	12 "	80.3	59.5	Ditto.
" "	1 P. M.	81.	59.5	Ditto.
" "	2 $\frac{1}{2}$ "	81.5	59.5	Ditto.
" "	3 $\frac{1}{2}$ "	82.3	59.5	Ditto.
" "	6 $\frac{1}{2}$ "	82.5	59.8	Ditto.
" 25	9 A. M.	76.5	60.	Ditto.
" "	10 $\frac{1}{2}$ "	79.5	58.8	Ditto.
" "	12 "	81.	58.7	Ditto.
" "	1 P. M.	82.5	59.	Ditto.
" "	3 "	84.	59.	Ditto.
" "	8 "	84.	59.	Ditto.
" 26	9 A. M.	78.	59.3	Ditto.
" "	10 $\frac{1}{2}$ "	80.5	59.	Ditto.
" "	12 "	82.8	59.5	Ditto.
" "	1 $\frac{1}{2}$ P. M.	85.	59.8	Ditto.
" "	3 "	85.5	59.8	Ditto.
" 27	9 A. M.	81.	61.8	Westerly wind occasionally,
" "	11 "	83.	60.	strong.
" "	12 "	84.	60.3	
" "	3 $\frac{1}{2}$ P. M.	86.5	61.	
" "	7 "	86.	61.	
June 6	7 A. M.	81.	66.	Usual.
" "	10 "	84.	64.5	W. wind beginning 9 A. M.,
" "	11 "	85.	65.	occasional very hot, with
" "	12 "	86.	65.	clouds of dust, blown from
" "	1 P. M.	87.	64.8	the desert.
" "	2 "	87.8	64.5	
" "	3 "	88.	64.5	

CANDAHAR.

Observations of the Wet and Dry Bulb Thermometers.—(continued.)

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
June 6	4 P. M.	88.5	64.5	
" "	6 "	88.5	64.5	
" "	9 A. M.	81.5	63.	Ordinary weather, occasional calms, but generally strong.
" "	10 "	83.5	64.	
" "	11 "	85.5	64.5	
" "	12 "	86.5	64.5	W. winds.
" "	2 P. M.	88.5	64.5	
" "	3 "	88.5	64.5	
" "	4 "	88.5	64.5	Ditto ditto.
" "	5 $\frac{1}{2}$ "	88.5	64.5	
" "	6 $\frac{1}{2}$ "	88.5	64.5	
" "	9 A. M.	83.5	62.5	Ordinary weather.
" "	10 "	84.5	62.8	Ditto ditto.
" "	2 P. M.	90.5	64.3	Ditto ditto.
" "	10 A. M.	88.5	69.5	Ditto ditto.
" "	12 "	90.	66.5	Ditto ditto.
" "	2 P. M.	90.5	66.5	Ditto ditto.
" "	10 A. M.	83.	64.5	
" "	12 "	86.5	65.	Calm and clear.
" "	1 "	88.	64.7	W. wind from 11 A. M. occasionally strong.
" "	3 P. M.	88.3	64.8	
" "	4 "	88.	64.5	
" "	5 "	88.	64.5	
" "	6 $\frac{1}{2}$ "	87.	64.5	
" "	9 A. M.	84.8	63.5	W. wind.
" "	10 "	85.5	63.8	Ditto strong cloudy.
" "	11 "	86.5	65.	Moderate.
" "	12 "	87.5	64.	
" "	2 P. M.	88.5	64.8	Calm.
" "	3 "	89.3	65.	W. wind, cloudy.
" "	4 "	90.	65.5	Ditto ditto.
" "	6 "	89.8	66.	Ditto ditto.
" "	9 A. M.	81.	63.	
" "	10 "	82.3	63.5	Calm clear.
" "	11 "	84.	63.5	Ditto.
" "	12 "	84.5	63.5	Slight W. wind.
" "	2 P. M.	85.5	63.5	W. wind.
" "	3 "	86.5	63.5	Ditto.
" "	4 "	86.8	63.5	Ditto.
" "	5 "	87.	63.5	Ditto.
" "	6 $\frac{1}{2}$ "	87.	64.	Ditto hazy.

CANDAHAR.

Observations of the Wet and Dry Bulb Thermometers.—(continued.)

Date.	Time.	Dry Bulb.	Wet Bulb.	Remarks.
June 17	9 A. M.	78.	63.5	
" "	10 "	83.	64.	
" "	11 "	84.	64.	Calm clear.
" "	12 "	86.	63.8	
" "	1 P. M.	86.5	64.	Very slight.
" "	3 "	87.5	64.5	W. wind.
" "	4 "	87.5	64.5	
" "	5 "	87.5	64.5	
" "	6½ "	88.	64.5	
" 18	9 A. M.	85.	64.5	Calm.
" "	10 "	86.5	66.5	Calm, sultry.
" "	11 "	88.	67.	Ditto ditto.
" "	2 P. M.	90.	68.	Ditto ditto.
" "	3 "	90.	67.5	Ditto ditto.
" "	4½ "	91.	68.	Ditto ditto.
" "	6 "	91.	68.8	Ditto ditto.
" "	6½ "	90.5	68.8	Ditto ditto.
" 19	9 A. M.	87.5	68.5	Ditto clear.
" "	10 "	89.	69.5	Ditto ditto.
" "	11 "	91.5	69.5	Ditto ditto.
" "	12 "	92.	69.	Ditto ditto.
" "	1 P. M.	92.	68.5	Ditto ditto.
" "	2 "	93.	68.8	Ditto ditto.
" "	3 "	93.	69.	Gusts of W. wind.
" "	4 "	93.	69.	Slight W. wind.
" "	5 "	92.5	69.	Hot W. wind.
" 20	9 A. M.	87.	68.5	Calm.
" "	10 "	88.	68.5	Ditto.
" "	11 "	91.3	68.5	Ditto.
" "	12 "	91.5	68.8	Ditto.
" "	2 P. M.	93.	68.5	Hot W. wind moderate.
" "	4½ "	94.5	69.	
" "	5½ "	95.	69.8	Ditto gusts.
" "	6½ "	93.8	70.	Ditto ditto.
" 21	8 A. M.	87.	69.	Calm.
" "	9 "	88.5	70.	W. wind.
" "	10 "	89.3	70.5	Ditto.
" "	11 "	88.5	75.	Ditto.
" "	12 "	88.5	72.	Ditto.
" "	1 P. M.	90.5	75.	Ditto.

CANDAHAR.

Observations of the Wet and Dry Bulb Thermometers.—(continued.)

Date.	Time.	Dry bulb.	Wet bulb.	Remarks.
June 21	3 P. M.	90.5	70.5	Calm.
" "	4 "	91.	70.	Ditto.
" "	6 $\frac{1}{2}$ "	91.5	70.	Ditto.
" 22	9 $\frac{1}{2}$ A. M.	89.5	70.	Ditto.
" "	10 "	90.5	70.	Ditto.
" "	11 "	92.0	70.	Ditto.
" "	12 "	92.5	70.5	Slight W. breezes.
" "	1 P. M.	92.8	70.5	Ditto ditto.
" "	2 "	92.8	70.5	Ditto ditto.
" "	3 "	93.	70.5	Ditto ditto.
" "	4 "	93.	70.5	Ditto ditto.
" "	5 "	92.8	70.3	Ditto ditto.
" "	6 "	93.	70.5	Ditto ditto.
" "	6 $\frac{1}{2}$ "	93.	70.5	Ditto calm, night.
" 23	8 A. M.	87.	68.5	Calm.
" "	9 "	87.5	68.5	Ditto.
" "	10 "	89.	68.	Ditto.
" "	11 "	91.	69.	Ditto.
" "	12 "	91.	69.	Ditto.
" "	1 P. M.	91.	69.	Ditto.
" "	2 $\frac{1}{2}$ "	92.5	69.	Ditto.
" "	4 "	93.	68.5	Slight W. wind.
" "	6 "	92.8	69.	Ditto.
" 24	8 $\frac{1}{2}$ A. M.	88.5	68.5	Calm, sultry.
" "	10 "	89.5	68.8	
" "	11 "	92.8	68.	Violent W. wind.
" "	12 "	92.5	68.3	
" "	1 P. M.	93.3	68.5	Calm.
" "	2 "	93.5	68.5	N. E. wind.
" "	3 "	95.	68.	Ditto.
" 25	9 A. M.	90.3	..	Calm.
" "	10 "	91.	..	
" "	12 "	92.3	..	
" "	2 P. M.	94.	..	W. wind.
" "	5 "	94.5	..	Ditto.

These observations were made in a largish mosque, with one small door to the Eastward, and several grated windows in the same direction, which were blocked up with jousa, and watered occasionally. The prevailing winds are Westward, so that the Thermometers were not exposed to their direct influence.

The wet bulb was a standard given me by the late J. Prinsep Esq. with an ivory scale and naked bulb divisions.

The dry one was a good Thermometer with an ivory scale, divisions 13 each belonging to Major Thomson, C. B.

*Proceedings of the Asiatic Society.**(Friday the 21st January, 1842.)*

A Meeting of the Society was held at its Rooms, at the usual hour, on Friday the 21st January, in consequence of an adjournment from a previous Meeting, on which evening a sufficient number of Members to proceed upon the important business before the Society was not present.

The following letter, conveying the resignation of the Honorable Sir EDWARD RYAN, as President of the Society, was read :—

Court House, December 20, 1841.

SIR,—I regret to find that it will not be in my power to attend the next Meeting of the Society, and I must therefore beg of you to tender for me my resignation of the office of President.

I cannot quit a Society on which I have so long presided, without expressing my deep sense of the uniform kindness and consideration with which the Members have been pleased to regard my humble efforts to discharge the duties of an office, which, if I had properly weighed my own qualifications, I ought perhaps never to have accepted.

It is highly gratifying to me to know, that however unworthily your chair may have been filled, by the exertions of your most able and excellent Secretaries the Society, during the last nine years, has greatly extended the reputation which it early attained amongst the learned Societies of Europe, under the auspices of its Eminent Founder.

I have the honor to be,

Sir,

Your obedient humble servant,

EDWARD RYAN.

TO HENRY TORRENS Esq.

Secretary to the Asiatic Society.

The Honorable H. T. PRINSEP stated, that as this letter had been referred to the Committee of Papers, it had been deemed proper to convene a special meeting of that body, at which it was determined that the following resolutions be proposed to the Society for adoption at their present meeting :—

Read the resignation by the Honorable Sir E. RYAN, of the Chair of the Society.

Submitted by the Honorable H. T. PRINSEP, Esq. and seconded by the Honorable Sir J. P. GRANT—That it seems to the Committee advisable, that the late President be requested to sit for his picture in England, to any eminent artist whom he may select as fitting for the purpose. The size of the picture to be Kitcat, in order to correspond with the pictures of the other eminent men, as Sir W. JONES, Lord WELLESLEY, Lord MINTO, &c. &c. already in possession of the Society.

Resolved—That this proposition be recommended for adoption to the Society, as a proper mode of recording the sense entertained by that body, of the value of Sir EDWARD RYAN's long and able services in the Chair, and the interest with which he has always regarded its proceedings in all branches of Science.

Proposed by the Honorable W. W. BIRD, Esq. and seconded by the Honorable Sir J. P. GRANT, that the Honorable H. T. PRINSEP, Esq. be recommended to the Society as a Member highly qualified by his high general attainments, and his known zeal in the pursuits of Oriental literature, as well as by his long standing in the Society, to take the Chair vacated by the Honorable Sir EDWARD RYAN.

Resolved—That the proposition be submitted accordingly.

H. TORRENS,

Secretary to the Asiatic Society.

The adoption of the first of these resolutions was then proposed by the Honorable H. T. PRINSEP, seconded by the Secretary, and carried unanimously.

The Honorable W. W. BIRD then rose, and after a just eulogy on Mr. H. T. PRINSEP's merits as an Oriental and general scholar, and as a most zealous and industrious member of the Society, with many feeling allusions to the transcendent merits of Mr. JAMES PRINSEP, a name so justly dear to the Society as that from whose labours alone have raised its fame so far above what it had ever before attained—Proposed in continuation, "That the Honorable H. T. PRINSEP be requested to accept of the office of President of the Asiatic Society."

The Right Reverend the LORD BISHOP, in rising to second this motion, paid a warm and a just tribute to the zeal and interest so constantly shewn in every matter relative to the Society's pursuits and affairs by its late President, the Honorable Sir EDWARD RYAN. His Lordship then addressing himself to Mr. PRINSEP as the future President of the Society, adverted to the Discourses of its founder, Sir WILLIAM JONES, as compositious well worthy of the close attention of its Presidents, from their enlarged views, and their general tendency to raise the character of its pursuits, and to render it, as it always had been, both in India and in Europe, the just and fruitful parent of Oriental learning and science. His Lordship also adverted in feeling language to the merits of the late Mr. JAMES PRINSEP, observing, that no one individual could do justice to them.

The motion was carried by acclamation.

The Honorable H. T. PRINSEP, on taking the chair, and returning thanks for the honour conferred upon him by the Society, said, that he felt he owed much more to the labours of his brother, than to any merits of his own: that he felt and knew that his heavy official duties during many years had left him far less leisure than he could have desired for the prosecution of his Oriental and other studies, and that he had thus been unable to do much, which he feared may have been expected from him.

He feared also, that it might now, with the scanty leisure he could still command, be too late to repair this, and to regain lost time, and that he could only thus promise zeal and devotion to the pursuits and interests of the Society, and express his earnest desire to tread in the footsteps of his lamented brother. He looked to, and fully trusted in much assistance from the labours of individual Members, and in the support which he should receive from the Society in the election of its Officers for the advancement of its interests and of its good name.

E. B. RYAN, Esq. was proposed as a Member of the Society, by H. TORRENS, Esq. and seconded by

A letter was read from DR. HÆBERLIN, reminding the Secretary that his proposition to elect DR. EWALD an Honorary Member of the Society, was yet before it.

DR. EWALD was unanimously elected.

The Secretary brought to the notice of the Society, that the Collection sent out by the Honourable the Court of Directors, as a basis for an Indian Museum of Economic Geology, had been made over to it, and arranged in a separate room appropriated to its objects; but that the extensive duties which the superintendence of a Museum of this nature would require, to carry out fully, and efficiently its great objects, the development of the whole inorganic products of India, were such, that it would require the attention of an individual. He stated, that it was well known by letters from home,

that the Court of Directors had authorised the Government to incur the expence of the nomination of a person charged to carry out their views, and that it might thus not be improper, were the Society to address Government on the subject. It was agreed that this matter should be left to the Committee of Papers.

The following Books, &c. were presented, and the thanks of the Society recorded for them :—

List of Books received for the Library of the Asiatic Society, for the Meeting on the 21st January, 1842.

Lane's Dictionary, English and Burmese. Calcutta, 1341, (3 copies).

Journal of the Bombay Brauch Society. No. 2, October 1841, pamphlet.

The Calcutta Christian Observer. January, 1842, No. 25, ditto.

The Oriental Christian Spectator. November 1841, Bombay, vol. 2d, No. 11, second series, ditto.

Society for the Encourgement of Arts, Manufactures, and Commerce. Premiums for the Sessions 1840-41, 1841-42. London, 1840, six copies, ditto.

Transactions of the Society for the Encourgement of Arts, &c. during the Sessions 1839-40, vol. 53d, part 1.

London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 3d series, vol. 19, No. 122, August 1841, London, pamphlet.

Proceedings of the London Electrical Society, Sessions 1841-42, London, ditto.

Transactions of the Geological Society of London, 2d series, vol. 6th, part 1st, 1841, ditto.

Journal des Savans. Mai, 1841. Paris.

Kittoe's Illustrations of Indian Architecture from the Mohammedan Conquest downwards. 1838, Nos. 1 to 12 and 21 Plates, equal to 5 Numbers. One plate over.

The Silurian System, from the Edinburgh Review, April 1841, No. 147.

Yarrell's History of British Birds. London, part 27th.

Some Account of the General and Medical Topography of Ajmeer, by R. H. Irvine. Calcutta, 1841.

Di un Vaso Greco Dipinto che si conserva nel real Museo Borbouico Discorso del Cavalier Bernardo Quaranta. Pamphlet.

Sula figura e L'Iscrizione egizia in cise in uno Smeraldo Quaranta. Napoli, 1826 ditto.

Nafhatul Yaman, a collection of pleasing stories and compositions, both in prose and verse. Hooghly, 1841.

Diwani Mootanubee. Hooghly, 1841.

Callery. Systema Phonicum Scripturae Sinecæ, pars prima et secunda. Macao, 1841.

Proceedings of the American Philosophical Society. 1841, vol. 2d, part 17th, pamphlet.

Icones Plantarum Indiæ Orientalis, by R. Wight. Vol. 2d, part 3d, ditto.

Transactions of the London Electric Society, from 1837 to 1840, London, 1841.

Spry's Plants, &c. required for India. Calcutta, 1841, (5 copies).

Masnabee-Kanoor, in Oordoo.

Naphasil-Logawd, in Persian.

An extract of a letter from DR. JAMIESON to MR. CLERK, Political Agent, N. W. Frontier, dated Camp Kalabagh on the Indus, Nov. 15, 1811, was partly read. From this it would appear, that with reference to the main objects of DR. JAMIESON'S mission, the discovery of good sources for a supply of Coal, there was not from the Geological character of the country, much chance of its attainment. Coal it is true, was found at Kalabagh in thin seams in a white sand-stone, which alternates with the red marls in which the rock salt and gypsum are imbedded, the largest seam being about 17 inches in breadth, consisting partly of coal, sand-stone, and mineral sulphur. About 2,000 maunds had been collected, but an exorbitant price, Rs. 4 per pukka maund, was demanded, as the people used it for medicine.

The oldest rock met with between Jabalpure and Kalabagh, is magnesian limestone, on which is the red sand-stone and red marl, and white sand-stone alternating with it.

In a lime-stone filled with organic remains, (probably the equivalent of the muschelkalk of Germany,) iron ores, red and brown hematite, occur in enormous beds. On the banks of the river, the sand is extensively washed for gold, so that we have here at once, iron, gold, sulphur, salt, gypsum, lime-stone, saltpetre, alum, and coal; all that is wanting to raise the town (Kalabagh) to one of the most important cities in India, being coal in quantity, with enterprise and capital; but DR. JAMIESON concludes, from the geological characters of the district, that no coal worth working will be found in it. The coal met with is partly lignite and partly jet, and not true bituminous coal; but from experiment it seems well adapted for Steam Vessels, burning with a good flame, and having but little residuum.

This valuable paper was referred to the Secretary, for publication in his Journal.

A letter and statement from Captain BAYLE, Superintendent Experimental Cotton Plantations, contradicting many points in the letter of Mr. BRUCE was presented. Referred to the Editor of the Journal.

A letter from Prince SOLTIKOFF, requesting permission to have copies made of those parts of the Mackenzie MSS. relating to Sculpture and Architecture.

Letter from the Secretary to Government in the General Department was read, forwarding copy of a circular from the Military Board to the Engineer and other officers employed on the construction of roads, recommending to their attention, as suggested by Mr. Acting Curator PIDDINGTON, the objects of the Museum of Economic Geology, and forwarding to them copies of Captain TREMENEERE'S paper. A box of tin and manganese ores from Mergui had also been sent by the Military Board, and these were accompanied by a report from the Secretary to the Coal and Iron Committee. Referred to the Journal.

A letter from Brigadier TWEMLOW, received through the Agricultural Society, with some specimens, was also referred to the Editor of the Journal for publication.

One from Dr. H. H. SPRY, forwarding specimens of copper ore from Cornwall, presented by Major JENKINS, for the Museum of Economic Geology.

From Captain KITTOE, with numbers completing a full copy of his valuable work on Indian Architecture, and offering his best services to the Society in Europe.

From Colonel FOGSON, requesting that the Society would republish in its Transactions, a paper published by Dr. CORBYN in his Journal, and forwarding a MSS. in continuation. Referred to the Committee of Papers.

The report of the Curator to the Society was read as follows :—

* *Animal Kingdom.*

MAMMALIA.

In this class of animals, I have the satisfaction to record the following donations :—

1st. A collection of numerous skeletons, in pieces, some extra skulls, frontlets and horns, and a few skins, together with specimens of other classes, from Mr. W. Masters: the former being referrible to the following species :—

Hylobates, apparently *H. Hoolock*, Harlan: a skull, older than those previously in the Museum, and cutting its third upper and second lower true molars, the third lower being also partly visible in process of formation.

Semnopithecus Entellus: the skeleton of a very fine old male, being a welcome acquisition to our collection.

Macacus, apparently *M. Rhesus*: a skeleton. *

Lemur, qy. species? : ditto.

Pteropus Edwardsii: ditto.

Megaderma Lyra: ditto.

Scotophilus castaneus: ditto. As the skulls of these three Bats have been minutely compared with other specimens in the Museum, prepared under my own direction, there can be little doubt of the correctness of their identification.

Vulpes Corsac (vel *Bengalensis*, *Indicus*, *Kokree*, &c. Auctorum): a skull.

Felis Tigris: the skeleton of a fine male; with four additional skulls, apparently of one male and three females; and a skin in bad condition of a very large Tiger. Our Bengal Museum was perhaps the only one in the world, of proportionate extent, that did not previously contain a skin of this renowned Bengal animal. A fine specimen for stuffing is still a desideratum, which I hope this notice will be the means of obtaining.

F. Pardus (vel *Leopardus*): a skull, and much injured skin.

Lutra leptonyx: a stuffed specimen, being a species and genus new to the Museum, though one of four species which have been obtained since our last meeting.

Ursus labiatus: a skull.

Talpa Europea: a stuffed specimen. Of this genus I may remark that our Museum contains a perfect specimen in spirits, from Sylhet (vide *J. A. S.* vii. 464), of the species inhabiting northern India (*T. micrura*, Hodgson); also an imperfect skin, of decidedly the same species, from Assam (noticed in *J. A. S.* vii. 464); and a skeleton, which I believe is also that of a specimen from the latter country. This animal, according to Mr. Hodgson (*Proc. Zool. Soc.*, 1834, 96), is, in Nepal, found only in the Kachar or northern region; it (or a species of Mole, in all probability the same,) is mentioned by Mr. Traill as an inhabitant of Kumaon (*As. Res.* xvi. 153); and the Hon. Mountstuart Elphinstone, in his volume on Kabul (p. 142), observes, that "Moles are only found in Kashmir". Lieut. Hutton states the existence of a Mole at Quetta (*Calc. Journ. Nat. Hist.* No. IV, 558). There can be little doubt that all these notices refer to the same species, which will probably prove to have a still more extensive range, especially to the eastward. As many as four species of true *Talpa* have now been ascertained, all of which are inhabitants of the continent

of Europe and Asia, one, however, being found in Japan. In Africa, at least South Africa, they are represented by the genus *Chrysochloris*, and in North America by *Scalops* and *Condylura*; in South America no *Insectivora* (Cuv.) have hitherto been discovered (for the *Sorex tristriatus* of Fischer has proved to be a genuine *Opossum*) and Mr. Waterhouse has well remarked that their place is there supplied by the numerous small Opossums, as in Australia by other analogous *Marsupiata*. There exists, however, a species of true *Insectivora* (Cuv.) in the island of St. Domingo, which constitutes the genus *Solenodon* of Brandt. No burrowing forms that can be considered analogous to the Mole and allied genera have as yet been discovered among the *Marsupiata*, but it is highly probable that such will eventually be found to exist.

Equus Caballus : a skull.

Elaphus Indicus : some molar teeth.

Cervus Hippelaphus : frontlet of a young animal.

C. Axis : skulls of an old male, a young male, and a female.

C. porcinus : a frontlet.

„ allied to *porcinus* : a pair of loose antlers.

„ *muntjac* : a frontlet.

Antilope Cervicapra : an imperfect skull, a pair of loose horns, and an odd horn.

Ovis Nahoar : horn of a female.

„ *Aries*, var : a skull.

Mus decumanus : a skeleton, and a stuffed specimen.

Cavia cobaya : a stuffed specimen.

Manis pentadactyla : ditto.

2d. I have to announce the present, from “a lady,” of a living female of the *Moschus Meminna*, Auctorum; this species I had never previously seen alive (as I often have its Malayan congeners), and certainly did not expect to find it so very bulky an animal, or in other respects so nearly allied to the recently discovered true Chevrotain of Western Africa (*M. aquaticus*, Ogilby, *P. Z. S.*, 1840, 35), a species which I had the good fortune to examine, or, in common, I imagine, with every other zoologist who has heard the announcement of a Chevrotain from that locality, I should certainly have been unable to resist the suspicion that the animal would rather have belonged to the Philantombah group of “Antelopes” (*Cephalophus*), or perhaps some allied form; it is, however, in all respects a thorough Chevrotain, nearly allied to the *Meminna*, and the first Cervine quadruped (with the exception of that very remarkable one, the Giraffe,) which has been discovered to the southward of the Atlas chain in all Africa: * its habits are remarkably aquatic, which circumstances I mention

* I say *Cervine*, because quite unable to appreciate any sufficient difference between the *Cervidæ* and *Moschidæ*, Auctorum, to justify their current separation into groups of the value of “families.” How, for instance, can the Muntjacs be placed in a distinct family division from the Chevrotains? With respect to the presence or absence of antlers, which is the only positive distinction subsisting between these two alleged families, it is well known that a South American group of tiny Deer have the appendages in question reduced to the permanent condition of *brockets*, or small branchless beams, to say nothing of the fact of their constant absence in one sex all but throughout the family; while, on the other hand, it is by no means clear, now especially that a plurality of species has been ascertained among the musk-bearing *Moschi*, that one or more of these is not actually furnished with antlers: witness the description of the musk-animal by the Arab historian, Abusseid Serafi, who (as cited

in the hope of inducing some investigation as to whether the Indian species may not participate in the same propensity; nothing of the sort (that I am aware) has hitherto been observed, or at least published, concerning it, nor from the skulking habits of the animal does it appear to have been much noticed in many districts where it is certainly found. In Ceylon, it is as common as Hares are in England; the natives trap great numbers of them in the interior of the island, and bring them almost daily to market in Colombo and other towns, where they sell for about a rupee each, and are esteemed very delicate-eating. In Colonel Sykes's list of the Mammalia of the Dukhun (*P. Z. S.* 1831, 104), it is mentioned that "considerable numbers exist in the dense woods of the Western Ghauts, but they are never found on the plain." Mr. Walter Elliot, in his 'Catalogue of Mammalia in the Southern Mahratta Country' (*Madras Journal*, No. xxv. 220), notices it as "common in the forest, and even occasionally

by Mr. Ogilby) states that "it is very similar to the Roe, *having long projecting tusks, and horns of a straight form or slightly pushed back*," so, also, in Bell's 'Travels in Tartary' (i, 224), we read that—"The *Kabenda* is a size less than the Fallow Deer, and its colour dark. It is of a pretty shape, having *erect horns without branches*; is very swift, and haunts rocks and mountains of difficult access to men and dogs; and, when hunted, it jumps from cliff to cliff with incredible celerity and firmness of foot. The flesh is esteemed better venison than any of the Deer kind of larger size, *of which there is a great variety in these parts* [neighbourhood of Elimsy.] *This is the animal from which the drug called musk is taken* * * *. There are many of them in this country, *but the musk is not so strongly scented as that which comes from China*. The General had bred this creature to be very familiar. He fed it at his table, with bread and roots; when dinner was over, it jumped on the table, and picked up the crumbs. It was pleasing to observe its gambols, playing with the children like a kid." With such opportunities, accordingly, for observation, it is very unlikely that the traveller should be mistaken in what he avers concerning its "horns."

I may remark here, that in an account of the anatomy of a "cis-Himalayan" Musk, by A. Campbell, Esq. published in *Jour. As. Soc.* vi., 119, the presence of a gall-bladder is noted, "of an oval shape, pendulous from the right half of the liver, and three inches long, by two inches and a half in diameter." Whether this viscus was found to exist by Professor Pallas, who furnishes an account of the anatomy of (I believe) a Tartarian specimen, I do not remember to have noticed, and have not now the work to refer to: the Chevrotains have none; and the existence or non-existence of a gall-bladder has generally been considered as an invariable distinction between the two great divisions of hoofed ruminants, being absent in the Cervine group; hence its occurrence in a true *Moschus* is remarkable, but it is well to quote the following from Professor Owen's elaborate description of the internal conformation of the Giraffe (*Trans. Zool. Soc.* ii. 227-8.)

"As the presence of a gall-bladder distinguishes the hollow-horned from the solid-horned ruminants, the investigation of this point in the anatomy of the Giraffe was attended with much interest; and the result of an examination of three individuals shews how necessary it is not to generalize on such a point from a single dissection.

"In the first Giraffe, (a female,) I found a large gall-bladder, which presented an unusual structure, being bifid at its fundus * * *. In the two males afterwards examined, there was not a vestige of a gall-bladder, but the bile was conveyed by a rather wide hepatic duct to the duodenum. I conclude, therefore, that the absence of a gall-bladder is the rule, or normal condition; and that the Giraffe in this respect, as in the structure of its horns, bears a nearer affinity to the *Deer* than to the *Antelopes*." Nor is this the only instance wherein an irregularity of conformation has been observed with respect to the presence of a gall-bladder: thus, in the class of birds, the French Academicians failed to detect it in four out of six specimens of the Demoiselle Crane, (*Grus virgo*); nevertheless, such instances of irregularity are extremely rare, and extensive groups are characterized (among other particulars) by the seemingly constant presence or absence of a receptacle for the secretion of the liver, which it would be out of place here to particularize; my object has been to call some further attention to the subject as regards the true Musks, the affinities whereof induce a suspicion that the case recorded by Mr. Campbell will prove to be exceptional or abnormal, as adjudged by Mr. Owen to have been the fact in the instance of his first Giraffe.—*CUR. As. Soc.*

seen in the Mulnad." Lieut. Tickell informs us that it "is found throughout the jungly districts of Central India, but from its retired habits is not often seen. It never ventures into the open country, where its want of speed would ensure its easy capture, but keeps among rocks, in the crevices of which it passes the heat of the day, and into which it retires on the approach of an enemy. In these the female brings forth her young (generally two in number) at the close of the rains, or the commencement of the cold season. The male keeps with the female during the rutting season, (about June or July,) at other times they live solitary. An idea," continues this gentleman, "prevails among the people in Singboom, not altogether void of probability, that at the season of the fall of the leaf, the 'Yar' never ventures beyond a few yards from its cave, as in walking along it sticks its sharp-pointed hoofs through the fallen foliage, which accumulates in such bunches on its legs as to cripple its movements altogether, should it prolong its rambles." (*Calc. Jour. Nat. Hist.* No. iii. 420.) How much further to the northward it may range, I possess no data for determining; but think it not unlikely that it will prove to inhabit suitable localities at the foot of the Himalaya.* A second specimen of this animal, very young, and but just dead, has been obligingly presented to the Society by Mrs. Linstedt.†

3rd. Dr. Wallich has favoured us with a fine specimen of a Jackal (*Canis aureus*), of which common species the Museum did not previously contain an example; and with a pair (male and female) of the Corsac, or small Indian Fox, (*Vulpes Corsac*), a species which before was represented only by a very shabby and mutilated stuffed skin, though we possess a good skeleton of this pretty little animal. The male now set up is a particularly fine and handsome one.

4th. Dr. Pearson has presented the Society with two handsome skins, but unfortunately mutilated of the fore-paws, and inordinately stretched lengthwise, of a species of Otter, which I will notice presently; and one of a Weasel, which I suspect to be an undescribed species, allied to *Mustela Sarmatica*. Size of the Ermine, or European Stoat, (*M. Erminea*), and also nearly allied to that species, but rather darker (I write from memory only of the Ermine) in its colouring, with the tail-tip dusky reddish-brown, and less developed than the black tail-tip of *M. Erminea*; middle of the face, from the upper lip to the occiput, passing between the ears, and gradually fading on the nape into the general hue of the upper parts, much darker brown than the rest, contrasting, though not abruptly, with the fulvous of the cheeks; chin white, and shoulders and sides of the neck densely mottled with ill-defined dull

* "Deer of several kinds, one a beautiful animal of the size of a Hare," are noticed as occurring upon Myn Pât, in Digurjah, in the *Bengal Sporting Magazine* for 1840, 536.

Mr. Hodgson has since noted the occurrence of a species which he considers new, and styles *Tragulus mimenoides*, in his Classified Catalogue of the Mammals of Nepal, *Jour. As. Soc.* 1840, 914. The generic appellation *Tragulus*, it may be remarked, applied by the late Mr. Bennett to the Chevrotains, was pre-bestowed by Col. Hamilton Smith on a group of small African Antelopes.

† When this was being mounted, I had the living one, which had been turned loose into a small enclosure, caught, that its form might be better imitated in the stuffed specimen; and the strength and vigorous resistance offered by the little creature, when taken, after rather a tiresome chase, were quite surprising: it struggled most violently, using its sharp hoofs with some effect; and, had it been a male, would doubtless have inflicted bad wounds with its tusks. This little animal is of a very indolent disposition, at least by day, when I have never known it move voluntarily from the bush under which it squats; upon being disturbed, it plunges among the herbage exactly like a Hog Deer.—E. B.

white spots, which suggest the name of *humeralis* for the species, should it prove to be new: length about a foot, or rather more; and tail minus the hair about five inches additional. From Darjeeling, as are also the Otters.

5th. Mr. Bouchez has presented us with a stuffed skin of *Lutra nair*.

6th. Among the recent specimens procured is a fine large female Otter, which appears to be the *L. Tarayensis* of Mr. Hodgson (*Jour. As. Soc.* 1839, 319), differing from the description given by that gentleman only in the under-parts being of a less whitish, or "pure yellowish-white" hue, and the paws scarcely albescent, but of a lighter and more fulvous brown than the rest. It also accords so nearly with Jenyns's description of the European species (*Brit. Vert.* p. 13), that I am doubtful if it will not prove to be the very same, though (judging from memory of the latter) it appears to me to be rather a stronger and stouter animal. General structure as described by Mr. Hodgson, and total length 46 inches, of which the tail (which is 3 inches broad at base, becoming much more depressed and tapering to the extremity,) measured $17\frac{1}{2}$ inches; girth immediately behind the shoulders $15\frac{1}{2}$ inches; limbs very robust, the anterior measuring $6\frac{1}{2}$ inches from elbow joint, and entire naked palm to the extremity of middle toe $3\frac{1}{4}$ inches; tarse, to end of middle toe $\frac{1}{4}$ inch, and hairy for $1\frac{1}{2}$ inch. This animal had *five* large abdominal teats, and not the slightest trace (internally or externally) of a third anterior on the left side; which circumstance is interesting, as shewing how little dependence can be placed on the number of teats as a specific character: the lactiferous vessels were fully distended, indicating that the poor creature was giving suck. The fur is short, and (so far as I can remember) absolutely similar in colour to that of the British Otter, having the throat and sides of the face, to a line even with the eye and posterior base of the ear, rather dull or cinerascens white, which colour occupies only the tips of the hairs, and less of them on the lower part of the front of the neck and on the chest, till beyond the latter the lower parts are but slightly hoary: feet as described; and tail dark underneath; the white of the face, throat, and upper part of the fore-neck only, is abruptly divided from the dark colour of the parts above. This animal was shot on the salt-water lake above Calcutta; and I have had both its skin and skeleton set up.*

The Otters which Dr. Pearson has presented agree with none of those described by Mr. Hodgson, but seem to be allied to the *L. monticola* of that naturalist, from which they differ in being not of a deeper, but of a more rufous, brown than the last; in the pallid hue of the under-parts being throughout abruptly separated from the brown above; and in "the intermediate incisors of the lower jaw" being placed in an even line with the rest, at least if the third or central pair be intended by Mr. Hodgson, but, if the second pair (intermediate to the central and the outermost) be meant, then there is a slight difference between this and the preceding species, wherein the series of lower incisors forms quite a straight line. Fur longer than in the preceding, more as in *L. leptonyx*, but much darker than in that animal, of a shining dark *colcothar*-brown at base, slightly grizzled with a pale annulation near the extremity; under-parts dull fulvous-white, formed by hairs of this colour, but moderately close, protruding through the dense inner felt which has a brown surface; this fulvous-white, too, is continued underneath to the tail-tip. Size about that of *L. nair*;

* The same species inhabits the Indus, and I very much incline to the opinion, that it is no other than *L. vulgaris*. Three living cubs have since been brought to me.—E. B.

but the skins have been stretched so completely out of all shape, that admeasurements of them would not be trustworthy. From Darjeeling, as before noticed.

I have also obtained a very fine recent example of *Paradoxurus typus*, which has been mounted: and two live kittens of the *Felis Chaus*, Guldenstadt, not of Geoffroy, or *F. Kutas*, Pearson, *Jour. As. Soc.* i. 75, and *F. erythrotis*, Hodgson, *ibid.* v. 233. This is the common Jungle Cat of Bengal, and has a wide geographic distribution. It was discovered in the Caspian marshes by M. Guldenstadt, and has since been met with in the north-west of Africa by Ruppell and others, where, however, it must not be confounded with the nearly allied *F. caligatus*, Tem., or "Booted Lynx," of the Appendix to Bruce's Travels, which is the *F. Chaus* of M. M. Geoffroy and F. Cuvier. In Persia it is common, as also on the Himalaya, but I am not aware of its occurrence in Peninsular India, where doubtless, however, it exists, nor did I expect to meet with it in Bengal. The young merely differ, as usual, in having the markings somewhat brighter and more clearly defined.

Lastly, I have had a specimen prepared of the common Hare of Bengal, *Lepus ruficaudatus*? Is Geoff. *Dict. Class.* ix. 381, seu *L. macrotis*, Hodgson, *Jour. As. Soc.* ix. 1183, being a name which, if I mistake not, is pre-occupied, beside that it is much more applicable to other species, such as that of Egypt, well represented on some of the antique paintings of that country; also *L. Indicus*, Hodgson, and *L. orientalis*, Brown, *Bengal Sporting Magazine*, July, 1836. This very common species was wanting to the Museum, and (as is oftentimes the case with the commonest animals) is all but unknown in Europe, where the *L. nigricollis* is erroneously supposed to be the common Hare of the Gangetic provinces, a species which I cannot learn is found in this part of India. I saw living specimens of the Black-necked Hare at Madras, and now regret that I did not secure some, for this species is wanting to our Museum; but I expected to find it equally abundant here, as also certain other animals which I could have procured on the same occasion. The Gangetic Hare is brought plentifully to the Calcutta bazaars, always alive if possible, and both it and *L. nigricollis* are remarkable for the loud squealing they emit when handled: they also bite severely if not taken up with caution. The flesh of the Gangetic species is very insipid. This animal is cited doubtfully by Mr. Ogilby as the *L. ruficaudatus* of M. Is. Geoffroy St. Hilaire, imperfectly described from a mutilated skin, and Mr. Ogilby adds a minute description of a specimen which was taken home by Dr. Royle, who informed him that the species is very common in the Doon and in the neighbourhood of Delhi: this appears to be the amount of what was known to European naturalists concerning it prior to the arrival of Mr. Hodgson's elaborate description of the species in the Society's Journal for 1841, p. 1183, where some notice occurs of its habits and favorite haunts. A previous description, however, exists in the *Bengal Sporting Magazine*, for July, 1836, where the following habitat is assigned to the species "Cauhal, Punjab, and the continent of India; but as yet unknown to the eastward of the Barampooter." The same writer adds, "the Hare in this country sometimes takes to earth when hard pushed, but this is no more than has been occasionally known in England.*" In this country, too, a Hare has more oppor-

* "The Hares of India are small, but very staunch, and have one more chance of escape than their brethren in Europe, namely, by running to ground." Capt. Mundy's *Sketches*, i. 369. They are occasionally hawked at with the *Falco luggur*, Jerdon, *ibid.* ii. 39.

tunity of putting this stratagem into execution, from the numerous holes or earths of animals all over the country. Their manners are, in every respect, the same as those of the English Hare: they are savage and ill-natured in their way, and fight with each other to desperation; and upon being wounded, they often bite and tear themselves; in consequence, a slight scratch often proves mortal. In some parts of the country they are very numerous, which an English game-keeper would not believe, considering the number of enemies they have, in the shape of Pariah Dogs, Jackals, Cats, Mongoose, Weasels (*Viverricula*), Hawks, Snakes, and though last not least, the native shikarees, who catch vast numbers of them, and sell them to the natives for two pice each, and to gentlemen for four annas. They surround a hush with nets about 3 feet high; the bush is then beat with sticks, when the Hare bolts out into the net, which he attempts to force himself through, and is caught unhurt. It is said that the fleetest Hares are found in Hurriana, where there are extensive plains; and I have been told that Dogs which could kill Hares with ease at Allyghur, were at a loss at Hansi, at which place I have often in vain tried them with the Rampoor and Persian Greyhound. I do not recollect ever being able to turn one, much less to catch it. A very superior breed of Dogs has now come into play, and no sportsman is seen with the large *tearing down* animals of by-gone times, when a poor little diminutive Indian Fox or a glutton Jackal were thought fit to contest in speed with *long Dogs*. The splendid Grey-hounds I lately saw at Meerut assure us those times are gone."

The genus *Lepus*, I may remark, has been very largely added to of late years, wherever the specific distinctions have been duly attended to. In North America alone, not less than 14 species have been clearly distinguished and described by my friend, the Rev. Dr. Bachman (*Vide Jour. Acad. Nat. Soc. of Philadelphia*, vii, parts i. and ii). It is not long since the Irish Hare (*L. Hibernicus*) was first recognised by the Earl of Derby to be totally distinct from the common species (*L. timidus*) of Great Britain and Europe,* so that three are now known to be indigenous to the British Islands, besides the Rabbit, which latter appears to have been introduced originally from Barbary into Spain, whence it has been naturalized over all temperate Europe. The labours of Ruppell and of Hemprich and Ehrenberg have made known a considerable number of species from Syria and the north-east of Africa; and it cannot be doubted that many remain to be discovered throughout Asia. In the Burmese territories, however, I have been informed by a gentleman long resident, and

* The Irish Hare grows as large, or nearly so, as *L. timidus*, but is much more nearly allied to *L. variabilis*; from which it is readily distinguished by the considerably more rufous hue of its coat, which is also less dense, and has the inner felt rufous instead of white. The length of a small male, weighing 4lbs. 10 oz., which I procured, was 19 inches, the tail with hair three inches more; ears three inches and a half, and length of fore-limb from elbow joint seven inches, and of hinder from knee to claw eleven inches: tarse with claws five inches and a half: as in *L. variabilis*, there is no black on the tail, except a few scattered hairs. The fur has the same general aspect as in that species, which is very different from that of *L. timidus*, being soft, of a sandy-brown colour, with curly hoary tips intermixed; beneath pale. Outside the ears it is much longer than in *L. timidus*; the latter are black-tipped, and pale posteriorly. The flesh resembles that of the Common Hare much more than the Alpine. This Irish species affects marshy situations, and when hunted leaps with great agility over the stone walls that divide the country in some parts. A considerable number of the *L. timidus* have lately been turned out in different parts of Ireland.

I may take this opportunity to notice another European species, which I suspect is new. I saw several harrels of the skins at one of the enormous collections of peltry exhibited at the half-yearly sales of the Hudson's Bay Company, where specimens

devoted to zoological studies, that none have hitherto been observed,* nor am I aware that any have been met with in the great islands of the Oriental Archipelago; but in China there are doubtless several, and one from that country has been figured by Messrs. Hardwicke and Gray as *L. Sinensis*, besides which the *L. variabilis* (or much more probably an allied species, gregarious in its migrations like various other rodents,) is known to inhabit Chinese Tartary. In Little Tibet, my friend Mr. Vigne observed a rather large species, a skull of which he took to England, and which, it may be, is the *L. Oistolus* vel *Æmodius* of Mr. Hodgson (*Jour. As. Soc.* ix. 1186),† and this or another species is "common everywhere in Afghanistan" (Elphinstone's *Cabul*, 141). Lieut. Irwin also notices that "Hares are generally diffused" in that country, and that "white Hares are chiefly found beyond the Jaxartes. In Cabul only is the Hare kept in a domesticated state, and they may be purchased in the market for half a rupee each. The Rabbit is not found in these countries, India, or Persia" (*Jour. As. Soc.* viii. 1007), i. e. not in a wild state, for there is no lack of domestic Rabbits in Calcutta.‡ In the Indian Peninsula, I know only of *L. ruficaudatus* (?), which Mr. Hodgson assigns to "the Gangetic plains and Sub-Himalayas," and *L. nigricollis*, which the same gentleman formerly included in his Catalogue of Nepalese Mammalia (*P. Z. S.* 1834, 86), as an inhabitant of the Tarai, though the omission of this species in his subsequent lists would seem to intimate that at that time he had mistaken the species. Col. Sykes states *L. nigricollis* to be "very common in the strong and bushy hills of Dukhun;" and I have some reason to suspect the existence of another upon the Neilghierries. A curious

from all parts of the world are brought together. On the same occasion I observed a pile of several dozen skins of the *Kobus ellipsiprymnus* (A. Smith) of South Africa. Of *Lepus*, were some large packages of skins of the Polar Hare, and the present species was known to the dealers by the name of *Polish* or *Russian Rabbit*, Length about a foot and a half; the ears two inches and a half, and tail with hair nearly two inches, moderately bushy, and pale brown above, having no black on it. Fur in winter about an inch and a half long, the basal third dusky or slate colour, then rather pale fulvous for $\frac{1}{4}$ inch, the remainder white; of one quality, delicate and lying straight, exceedingly soft, and winter surface appearing pure white; the ears black at base of hairs, but overlaid with white, the edges alone appearing black. A specimen, apparently killed in autumn, with white hairs growing among the rest, had the summer coat fulvous with black tips, the fulvous changing to white before being shed, and the front part of the outside of the ears brown; skin remarkably thin and delicate. It is possible that this may be the *L. hybridus* of Pallas, which I do not know; but, if undescribed, it might bear the appellation of *L. Sclavonicus*.

A species of Hare from Sardinia has lately been described by M. Wagner, by the name *L. Mediterraneus*. The islands of Sardinia and Corsica are highly remarkable in their Zoology, containing besides a peculiar Weasel (*Mustela boccamela*), a distinct Stag from that of Italy and the continent of Europe (*Cervus Mediterraneus*), the wild Moufflon Sheep, &c; nor is the botany of the same islands less remarkable. E. B.

* Since writing this, I have been informed that a species of Hare, nearly resembling if not identical with that of Bengal, is common on the Siamese hills, on the eastern border of the Company's territory; and reverting to Crawford's "Embassy to Ava" (p. 456), I find it there stated that "the Hare is not known in Pegu, but makes its appearance on the high lands before the disembovement of the Irawadi. It is a small animal, similar, in all respects, to the Indian Hare."—E. B.

† Described, I now find, in *Proc. Zool. Soc.* for Jan. 26, 1841, as *L. Tibetanus*, Waterhouse, and presumed to be identical with *L. oistolus*, Hodgson; vide *An. and Mag. Nat. Hist.*, Nov. 1841, p. 231.

‡ Vide the last No. of this Journal, x 979, for another notice of the Hares of Afghanistan.

species has been described by Dr. Pearson from the northern hills, which would scarcely seem to be either a true *Lepus*, or a *Lagomys*. "Its hair is harsh and bristly; ears very short, not projecting beyond the fur; length 18 inches, and colour more dusky grey than that of the [Gangetic] Hare. Inhabits Assam, especially the northern parts of the valley along the base of the Bootan mountains" (McClelland, in *Proc. Zool. Soc.* 1839, 152). Dr. McClelland adds, "I am indebted to Lieut. Vetch of Assam for the skin of this animal, but unfortunately the skull is wanting; but according to Mr. Pearson it is the same as the skull of the common Hare." Were it not for the last statement, I should have conjectured the animal to have been a true Marmot. Dr. Pearson names it *L. hispidus*.

FOSSIL MAMMALIA.

In this interesting department, I have the pleasure to record the acquisition of another fine head, at least the greater portion of one, of *Mastodon Elephantoides*, which was purchased for the Society by Mr. Piddington. It was imbedded in a very hard grey limestone, apparently the same as, or differing very little from, the matrix of some of the Sivalik fossils, whence it is probable that it was derived from the same Sub-Himalayan formation.

I have also been so fortunate as to discover, among the numerous valuable reliques from the Sivalik ranges, which were presented to the Society by Col. Colvin (vide *Jour. As. Soc.* v. 183), part of the head and bony cores of the horns of a large species of *Ovis*, nearly allied to, if not absolutely identical with, the *O. Ammon* of Siberia (vel? *Hodgsonii*, Nobis, seu *Ammonoides*, Hodgson, of the Himalaya); and a corresponding portion of a true *Ibex*, to all appearance identical with the species (*Capra Sakeen*, Nobis,) which still inhabits the loftiest Himalayan crags. It is unnecessary to dwell here upon the conclusive proof afforded by the occurrence of these highly interesting remains of the existence of lofty, and even snow-clad, mountain heights in the immediate vicinity of the region then tenanted by the *Sivatherium* and its extinct contemporaries; but I shall avail myself of the earliest opportunity to draw up a memoir on the subject, illustrated by figures of the splendid fossils which there cannot be the slightest hesitation in identifying (generically) as aforesaid.

In the same collection of remains, is the frontlet with portions of the cores of the horns of a remarkable large species of ruminant, which being neither referrible to the Oxen, Sheep, nor Goats, has (as is customary in such cases) been assigned to the general receptacle for such non-conformists—the vast *pseudo-genus* *Antelope*; but it is as distinct from any of the living forms hitherto discovered and ranged in that empirical assemblage, as many of the latter are from each other. At present, I hesitate as to which of them it even most approximates.

AVES.

In the class of Birds, our acquisitions, since the last Meeting, have been so very considerable, that I can only notice a few of the more interesting, either as being apparently new, or rare, or for the purpose of elucidating their synonymy. From R. W. G. Frith, Esq. the Society has received a donation of 165 specimens of skins,

referrable to more than 100 species, 20 of which are new to the Museum, and many more equally acceptable. The greater number of them were procured in Upper Bengal, or in the hills, but there are some from Malacca, and among these, it is worthy of notice, 4 species of South American birds were received, which are as follow:—

Galbula ruficauda, Cuv: male and female.

Pipra rubricapilla, Tem.

Tanagra azurea? being the species figured in Griffith's Animal Kingdom, vii. 490, as the "Azure Tanager": two specimens, and a

Xanthornus, apparently the *Oriolus Americanus*, Gmelin.

These are strictly forms characteristic of the western continent: though it may be mentioned here, that in the "Proceedings of the Zoological Society" for 1836, p. 113, Mr. Burton exhibited a small Himalayan bird referred by him to *Pipra*, as "the first species of this genus hitherto discovered in those regions;" it might be equally averred, on the whole eastern continent, though the oriental genus *Calypomena*, Horsfield, is unquestionably allied to *Pipra* and *Rupicola*, as also, probably, the *Crataiopyx* of Eyton (*P. Z. S.* 1839, 104). With respect to the Jacamars (*Galbula*), it is remarkable that Levaillant positively asserts having received his *Jacameros* (the *G. grandis*, Latham,) from the Eastern Archipelago, and Cuvier followed him in considering this as the type of a supposed oriental section of the genus (*Regne Animal*, i. 448); but it has since been ascertained to be South American, like all of its congeners hitherto discovered.

Among those eastern species which may be noticed, I shall distinguish such as are new to the collection by an asterisk.

* *Palæornis Malaccensis*, Vigors (*Zool. Jour.* ii. 520), and figured in the volume on Parrots in Jardine's "Naturalist's Library."

* *Falco luggur*, Jerdon (*Madras Jour.* No. xxiv. 80); apparently an adult female of this fine species, which is nearly allied to the Lanner (*F. lanarius*.)

Hyptyopus (Hodgson, *Jour. As. Soc.* 1841, 27, olim *Baza*, H. *Jour. As. Soc.* 1836, 777,) *lophotes*; *Falco lophotes*, Tem; *B. syama*, Hodgson; *Buteo cristatus*, Vieillot; *Lepidogenys Lathamii*, J. E. Gray: two fine specimens.

Circus melanoleucos.

Alcedo (subgenus *Ceryle*, Boie, 1828, *Ispida*, Sw.,) *guttatus*; two fine specimens.

Dacelo pulchella, Horsfield, male and female; at least I judge what I have termed the latter to be of this species, though differing much in plumage from the male (which is figured in Dr. Horsfield's *Zoological Researches in Java*); there is no blue upon its plumage, the upper parts of which are everywhere barred with rufous on a black ground, these markings being widest upon the wings and tail, and closest and narrowest about the neck; cheeks and ear-coverts like the crown, and under-parts ruddy white, barred with dusky across the breast and on the flanks. Mr. Eyton (in *P. Z. S.* 1839, 101,) classes this species in *Halcyon*, but I see no reason to follow his example.

Merops Sumatranus.

Napophila (Hodgson, *Jour. As. Soc.* 1841, 29, olim *Bucia*, H., *Jour. As. Soc.* 836, 360,) *amicta*; *Merops amictus*, Tem.

N. Athertonii, *Merops A.*, Jardine and Selby (*Ill. Orn.*, pl. lviii); *Nyctiornis caruleus*, Swainson; *Napophila* (olim *Bucia*) *Nipalensis*, Hodgson; *Merops cyano-*

gularis, Jerdon;* genus *Alcemerops*, Is. Geoff. (1832), apud G. Gray; of these various names, I could wish to adopt the more recent *generic* appellation bestowed by Mr. Hodgson, but his *specific* term, independently of its lack of priority, is objectionable, insomuch as that the bird is found both on the Neilghierries and in the Malay peninsula, whence it extends northward through Tenasserim to Assam and Nepâl. *Nyctior-nis*, Sw. is inapplicable, for, according to Mr. Hodgson, "the bird is in no way or degree a night bird" (*Jour. As. Soc.*, 1841, 29),† while *Napophila* is expressive of its haunts, and *Alcemerops* (implying an intermediateness to *Merops* and *Alcedo*, which I am quite unable to discern,) is certainly not a felicitous compound. Both in habits and internal structure, to judge from Mr. Hodgson's description (*Jour. As. Soc.* 1836, 362), these birds are intermediate rather to the Bee-eaters on the one hand, and on the other the Jacamars and true Todies of South America; they have much the same puffy plumage, also, as the latter; and whereas the true Bee-eaters (*Merops*), Rollers (*Coracias* and *Eurystomus*), and Kingfishers (*Halcyon*, *Alcedo*, &c.), which, with the exception of a few large species of the last, are peculiar to the eastern hemisphere, have the intestinal canal devoid of cæcal appendages, Mr. Hodgson describes the present bird to have *cæca* of an inch or more in length, in which particular it accords with the Jacamars (*Galbula*), Todies (*Todus*) and Motmots (*Prionites*), of South America. Mr. Hodgson adds, that the stomach and intestines of *Merops* are similar to those of *Napophila*, but this is at variance with my own observations of the former, wherein I could never detect any trace of *cæca*.

Picus Sultanus, Hodgson (*Jour. As. Soc.*, vi. 105); agreeing, at least (as does also another specimen in our collection), in every particular except size with Mr. Hodgson's description. This naturalist, indeed, remarks that "there is another Nepâlese species scarcely distinguishable from this by colours, and which has been confounded with it by those who venture to describe from one or two dried specimens. The two species differ, however, *toto cælo* in all typical and characteristic respects." Hence it is clear that our present bird cannot be here referred to, and little less so that the Indian three-toed Woodpecker (*P. tiga*, Horsfield,) is intended, for this species scarcely differs in colouring, except in having the back of the neck black instead of white, and in the relative breadth of certain markings on the sides of the neck. The dimensions which Mr. Hodgson assigns to both sexes of *P. Sultanus*, are 15 inches long by 23 inches across; bill $2\frac{1}{2}$ inches long; 1st quill feather 3 inches shorter, and 2d 1 inch shorter, than the 5th. In the larger specimen now before me, the entire length could scarcely have exceeded 13 inches (may not 15 have been a misprint?); bill from forehead barely 2 inches, and in the other not $1\frac{7}{8}$ inch; from gape $2\frac{1}{4}$ inches and $2\frac{3}{8}$ inches; wing from bend 7 inches and $6\frac{3}{8}$ inches; the first primary respectively $2\frac{5}{8}$ and 3 inches shorter, and the second nearly $\frac{7}{8}$ in. and $\frac{3}{4}$ in. shorter, than the fifth. Both are males, and in all other respects precisely accord with Mr. Hodgson's description.

Cuculus (subgenus *Chalcites*, Swainson, *Lampromorpha*, Vigors,) *lucidus*, Gmelin: a splendid male. The female of this species is described as *C. Malayanus*, Raffles

* Also, I much suspect, *Nyctior-nis Amherstiana* of the catalogue of birds in Dr. Royle's *Illustrations of the Botany, &c. of the Himalayas*.—E. B.

† Mr. Jerdon has since remarked the same, in the *Supplement* to his valuable catalogue of the birds of Peninsular India.

(*Lin. Trans.* xiii, 286), and the *C. metallicus*, Vigors (*Ibid.* xv, 392), is no other than the young, as satisfactorily shewn by specimens in transitional state of plumage.

* *Podargus* — ?

* *Lanius nigriceps*; *Collurio nigriceps*, Franklin (*P. Z. S.*, 1831, 117).

Picus tristis: female.

* *Yunx torquilla*; taken near Calcutta.

* *Pteruthius erythropterus*, Swainson; *Lanius erythropterus*, Vigors and Gould: a young male, agreeing with Gould's plate of the female, except in having a conspicuous whitish eye-streak, like that of the adult male, while the crown and back are uniformly greyish brown, the feathers of flimsy texture, and slightly tinged with greenish on the scapularies; under-parts white, having some growing new feathers tinged with fulvous on the sides of the breast. An adult female before me differs from Gould's figure of this sex in having the upper-parts darker and more inclining to cinereous-brown, quite a different hue from that on the plate, and the crown much darker and dusky grey; bill more hooked than in the young bird.

Muscipeta paradisea; two males, which sex is new to the Museum.

Phænicura atrata, J. and S. (*Ill. Orn.* pl. lxxxvi): male and female; the former new to our collection, and differing from the figure referred to, and the Latin definition of the species, in wanting the bright rufous margining of the wing feathers, which are edged with greyish, having but a slight rufous tinge on the border of the tertiaries only. Of the various Indian true Redstarts, this is the only species I know of which occurs in the southern parts of the Peninsula,* and the present are the only specimens I have seen of it from the northern hills. It is common in the vicinity of Calcutta.

* Mr. Hodgson, in the "India Review," (for 1837, p. 65,) has described a small group of birds allied to the Redstarts, but quite properly distinguished from them, which he there styles *Niltava*, having since substituted the appellation *Chaitaris* (*Jour. As. Soc.* 1841, 29); three species are distinguished by him, of which two appear to have been previously named; viz. *Ch. brevipes*, H., which is the *Phænicura rubeculoides*, Vigors, (*P. Z. S.* 1831, 35), as identified by Mr. Hodgson; *Ch. fulgiver*, H. which, from comparison of the descriptions, would seem not to differ from *Phænicura McGregorii*, Burton (*P. Z. S.* 1835, 152); and *Ch. sundara*, Hodgson, of which beautiful species a fine specimen occurs in the present collection, with two of *Ch. rubeculoides*, all males. In another collection of birds now confided to my charge from Darjeeling are two males and a female of *Ch. sundara*, and two males and two females of an additional true species, considerably larger than the others, which I intend to describe as *Ch. grandis*. The group is an extremely natural one.

Turdus (Oreocincla, Gould.) Whitei, Eyton.

* *Crateropus ocellatus*; *Cinclosoma ocellatum*, Vigors.

* *Oriolus Traillii*, Hodgson; *Pastor Traillii*, Vigors and Gould: a female.

* *Chloropsis*, J. and S., seu *Phyllornis* of Temminck: two species. One is the *Chl. Sonnerati*, J. and S., or *Ph. Mullerii*, Tem.; two males, and new to the collection: the other the *Chl. Hardwickii*, J. and S. (described in the *Addenda* to the 2nd volume of the "Illustrations of Ornithology," from a coloured figure in the collection of the late Major General Hardwicke), seu *Chl. cyanopterus*, Hodgson, and *Chl. chryso-*

* Mr. Jerdon has lately described two others in his *Supplement*.

gaster, McClelland and Horsfield (*P. Z. S.* 1839, 167). There are two specimens also of this bird, which form an interesting series with two others previously in the Museum, illustrative of the changes of plumage undergone by the species. Other specimens from Darjeeling are also before me, and I avail myself of the occasion to note the following particulars: the young male has all the upper-parts, with the breast, uniform Parrot-green, tinged with yellow on the throat; the hyacinthine streak from each side of the base of the lower mandible being reduced to slight tips to the feathers, by no means conspicuous; the lower tail-coverts are green, and this appears to have been also the case with the whole under plumage; shoulder-spot as usual: the fully (?) mature female differs in having the upper-parts a slight shade more yellowish green, but there is no yellow on the throat, which is tinged with verditer, and has a well-defined hyacinthine streak on each side, not quite so deeply coloured as in the male; below the breast, the under-parts are mingled green and buff-orange, the lower tail-coverts being of the latter hue, and the primary wing and tail feathers are green, the latter a little tinged with bluish on their inner webs, and the former being slightly edged with dull verditer, towards the tips only, excepting on the three outermost: at the first moult, when the wing and tail primaries (as in various other birds) are not changed, the young males assume the dusky-purple, or purplish-black, colour of the throat, fore-neck, and breast, the black lores and ear-coverts, bright hyacinthine moustache, and golden-buff colour of the belly and under tail-coverts, and one of three specimens before me (in different stages of this moult,) having lost one of its caudal feathers, no doubt by accident, has had it replaced by one a little longer than the rest, and of a purple colour slightly mixed with green; more or less dusky-purple also appears, at this age, on the smaller wing-coverts, and especially below the generic verditer tuft upon the shoulders of the wings; the crown inclines to yellowish, and in fact the mature plumage is everywhere attained, excepting on the wings and tail; the primaries and their coverts, with the winglet, and the caudal feathers, but not the coverts of these, appearing, at the second moult, of a rich dark purple, which is characteristic of the fully mature masculine livery, and hence Mr. Hodgson's appellation of *cyanopterus*.

Cinnyris mysticalis: *Nectarinia mysticalis*, Temminck; *Goalpara Creeper* of Latham, and *Certhia Goalpariensis* of Royle's "Illustrations"; *Cinnyris Vigorsii*, Sykes, *C. miles*, Hodgson, and *Nectarinia Seheria*, Tickell. A fine specimen of this gorgeous little bird, the range of which extends from the Himalaya to the Deccan, and through Tenasserim and the Malay Peninsula to Java.

* *C. Horsfieldi*, Nobis; a beautiful little species, allied to the last, together with *C. Nipalensis*, *Gouldii*, *saturata* vel *Assamensis*, and several others, which I mean shortly to describe—as also,

* *Anthreptes macularia*, Nobis: a species allied in plumage to the *Arachnothera*.

Eurylaimus nasutus, Tem. Mr. Swainson designates this species the "Black-billed Gaper;" but I am assured that the beak is of a beautiful blue colour in the living bird.

Eur. ochromalus, Raffles, *Lin. Trans.* xiii, 297; the preceding species being there described as *Eur. lemniscatus*, Raffles.

* *Coccothraustes melanoxanthos*, Hodgson (*As. Res.* xix. 150). A magnificent species of true Hawfinch, unfortunately not in very good condition, and in nestling

plumage. Length 9 inches, wing from bend 5 inches, and tail, which is slightly forked, 3 inches to end of exterior feathers; bill, in this young bird, nearly 1 inch long from forehead, and more than $\frac{3}{4}$ inch deep: plumage very like that of a nestling Goldfinch (*Carduelis elegans*), tinged with yellow on the abdomen, and especially on the under tail-coverts which are spotless yellow; also on the inner webs of the central dorsal feathers, forming the same mesial streak along the back as in a Siskin or Redpole Linnet, a young Crossbill, &c.; the rest of the back, scapularies, rump and upper tail-coverts, dusky, each feather margined with brown, which passes into greenish towards the tail; tertiaries shaped as in a European Goldfinch, and broadly edged with yellowish-white towards the extremity of their outer webs; primaries and secondaries slightly edged, and their greater and smaller coverts tipped with the same, the latter forming two narrow bars across the wing; crown and neck pale buff at the bases of the feathers, which have each a large dusky spot at its tip, causing the crown to appear of this colour; a pale streak over the eye, and a narrow one tinged with yellow from the gape, above which latter a broad dusky streak passes through the eye, and below it is a large triangular spot of the same; under-parts pale fulvous, or deep fulvous-white, becoming gradually more yellowish to the tail-coverts, each feather, excepting on the throat and middle of the belly, having an oval dusky spot; a line of such spots proceeds also from each corner of the lower mandible down the sides of the front of the neck: a few new feathers which were growing on the breast are brighter-coloured, with the spot very much reduced in size; hence the specimen would appear to have been a female, according to the description furnished by Mr. Hodgson. That naturalist described another species from the Himalaya, as *C. carnipes*; a third from the same mountain regions exists in the *C. icterioides*, Vigors (*P. Z. S.* 1831, 8, and figured in Gould's *Century*); and a fourth, from the neighbourhood of Canton, is figured by Messrs. Jardine and Selby ("Illustrations of Ornithology," pl. lxiii), as *C. melanura*; besides which, the European *C. vulgaris* is included in M. Temmiuck's Catalogue of the birds of Japan.

Pyrgita cinnamomea, Gould (*Proc. Zool. Soc.* 1835, 185), male and female—We before possessed specimens of this handsome Sparrow from Bootan, but the present are considerably more brightly coloured, and their plumage less worn: the sides of the neck of the male are pale clear yellow, divided by the broad black gular streak; and the middle of the abdomen also is much tinged with the same; whole upper plumage and fore-part of the wings, anterior to the white tips of their smaller coverts, bright cinnamon-rufous, marked as in other Sparrows on the middle of the back: the female has also a slight tinge of this rufous, especially on the sides of the neck, the rump, and the fore-part of the wings, and there is a faint tendency to yellowish beneath; one of two specimens of this sex has the dark gular streak of the male moderately distinct. I am acquainted with five species of true *Pyrgita* inhabiting India (one of them new), but have seen none corresponding to the *Passer Indicus* of Messrs. Jardine and Selby (*Ill. Orn.* pl. cxvii).

Argus giganteus, Tem. An exceedingly fine specimen of the female, which is much rarer in collections than the male, and bears a far higher price among the dealers.

* *Cryptonyx coronatus*, Tem. ; male and female.

* *Otis*. Two specimens of Bustards, alleged to be the *Floriken* and the *Leek* of Indian sportsmen: much confusion prevails respecting the application of these two

names, arising from the circumstance that all the species of this genus change their plumage twice in the year, and that in many of them the breeding dress of the males is so different from that which succeeds it, that observers are apt to regard as different species what are merely two seasonal phases of the same bird; nor is this the only source of confusion in the present instance; there really are two Indian species, which by some are more appropriately distinguished by the names mentioned; while others regard the males of both in nuptial livery as the *Floriken*, or *Black Floriken*, and refer them to the *Leek*, or *Common Floriken*, when in the plumage which alternates with the breeding dress; a third class, having observed the mutation in one or the other of these species, and thus positively ascertained that the alleged *Floriken* and *Leek*, as known to them, are one and the same, naturally enough conclude that but one species is referred to by these appellations, as indeed appears to be truly the case in Southern India, where the *Leek* of Bengal, or *Otis aurita*, is the only species included in Mr. Jerdon's valuable catalogue, in addition to the large *O. nigriceps* (figured in Gould's Century), which is there exclusively styled *Bustard*. The specimens now under consideration consist of a beautiful male of *O. deliciosa*, Hardwicke, (or *Himalayana*, Vigors,) in full nuptial costume (as figured in Gould's Century), being the *Black Floriken*, and in its other dress the *Common* or *Bastard Floriken*—as sometimes distinguished from the *Leek*—of Bengal; and a female in summer dress of *O. aurita* (figured in Jardine and Selby's 'Illustrations of Ornithology,' plates xl. and xcii), which, as before mentioned, is the genuine *Leek* of Bengal, at least of those who properly distinguish the two species; this latter is a much smaller bird than the other, and may always be at once recognised by the remarkable attenuation and sharp points of its wing primaries; it is a species new to our collection.

Among the Birds which have been procured in the neighbourhood, I may first proceed to notice two fine species of Erne, or Fishing Eagle, (*Haliaëtus*, Savigny.) One is the Ring-tailed Erne (*H. Macei*, or *Falco Macei*, Tem.), and from which I cannot perceive in what the *H. albipes* of Mr. Hodgson (described in *J. A. S.* v. 228, and further noticed in vi. 367-8,) differs, bearing in mind that *H. Macei* was originally described from a dry skin; moreover the *H. unicolor* of Mr. Gray, founded on one of the drawings published by him from the late Major Gen. Hardwicke's extensive collection, I very strongly suspect will prove to be merely the second plumage of the same bird. Our Museum contains two specimens of this alleged *H. unicolor*, one of them being known with certainty to be of the age mentioned; otherwise, it might have been suspected, from the lengthened and attenuated form of its nuchal plumes, to have been older; it is probable that the third plumage of the species will prove to be intermediate, and I trust to be soon able to procure one in transitional state of feather, which would settle the question beyond dispute. This fine large species, the worthy oriental representative of *H. albicollis* in Europe, *H. leucocephalus* in North America, and three or four more in different regions, appears to be not uncommon in Bengal, and is included in Dr. McClelland's Catalogue of the birds of Assam (*P. Z. S.*, 1839, 153), appearing, indeed, to be plentiful throughout the course of the Ganges and Boorampooter with their tributaries; but it is not mentioned in any of the lists which I have seen of the birds of Peninsular India, not even in the very elaborate catalogue furnished by Mr. Jerdon, and published in successive numbers of the *Madras Journal of Literature and Science*. Mr. Hodgson mentions that his *H. albipes* frequently robs the Osprey of its spoil, just as the White-beaded species of the west does, the Osprey of that re-

gion; the latter, indeed, being specifically the same on both continents. The magnificent specimen of *H. Macei* now exhibited, as also another which I have procured and set aside as a skin, both of them females, measured 2 feet 8 inches long by $6\frac{1}{4}$ feet in extent of wing. The form is typical, as exemplified by *H. albicollis* and *H. leucocephalus*.

The other species I have not been able to determine: it belongs to the group of Osprey-like *Ernes* (*Ichthyætus*, Lafresnoy), peculiar to the countries bordering on the Indian Ocean, and exemplified by *I. Horsfieldi* (*Falco ichthyætos*, Horsf.), *I. blagrus* (*H. plumbeus*? Hodgson), the Australian *I. leucogaster*, Gould, and I believe some others.* Our Museum previously contained examples of *I. Horsfieldi* and *I. blagrus*. The present species is figured in one of the drawings of the late indefatigably laborious Dr. Buchanan Hamilton, and a female procured in the vicinity of Calcutta measured $2\frac{1}{4}$ feet long by 6 feet $1\frac{1}{2}$ inch in extent of wing; the latter from bend $21\frac{1}{2}$ inches, and tail 14 inches: bill, including cere, $2\frac{5}{8}$ inches over curve of upper mandible, and $2\frac{1}{3}$ inches from its point to the gape; tarse posteriorly $3\frac{1}{8}$ inches; talons moderately large, with trenchant inner edges (wherein this species differs from *I. Horsfieldi*, and less decidedly from *I. blagrus*), and foot very rough underneath. Bill whitish-horny, having a tinge of bluish for the basal half, and becoming dusky towards the tip; cere scarcely differing in hue, but slightly waxy. Irides white, or rather becoming white, being a little suffused with brown in the specimen. Legs and toes ivory-white, as in *H. Macei*; but differing from that species in scutellation, having a series of nine large scales along the whole outer front surface of the tarse, and those on the toes, especially on the hind one, being remarkably prominent and projecting towards the talons. General aspect, at first glance, not unlike that of an Osprey (*Pandion*); the head, neck, under-parts, thighs, and tail, white, tinged more or less with rusty-brown, and the new feathers, which are everywhere appearing among the rest, more deeply so, whence these parts, excepting perhaps the tail, would have become clear pale rufous, confusedly mottled with dusky on the sides of the breast and upon the crown: the tail is much cuneated, and has some irregular scattered dark spots on its basal half, while the extremity is confusedly freckled with dusky, darkest on the outermost feathers, the extreme tips being whitish: wings and mantle aquiline-brown; the primaries dusky, the interscapularies slightly tipped with white, and the small wing-feathers which are impended (more or less) by the scapularies, conspicuously bordered with the same; an ill-defined bar of paler brown across the wings. The intestines of this bird were elongated, as in the Osprey: in its stomach were found three small water-snakes, some articulæ of Crustaceans, the humerus of a bird the size of a Mynah, and the remains of a small rodent. Dr. Cantor recognises the species as one which he has examined and found aquatic snakes in its stomach. Should it be undescribed, I proposed to designate it *I. cultrunguis*.

* *Athene Indica*; *Noctua Indica*, Franklin, *P. Z. S.* 1831, 115; *Strix Brama*, Temminck. A specimen also occurs in Mr. Frith's collection. It is probable this little Owl will soon be found to be admissible into the European Fauna, for it is ascertained to be "common about the foot of the mountains near the town of Erzerroom" (*P. Z. S.* 1839, 119).†

* The Society has since received a small species from the Malay Peninsula, nearly allied to *I. Horsfieldi*, and which I shall describe as *I. nanus*.—*CUR. AS. SOC.*

† Vide especially a notice in *Mag. Nat. Hist.* for October 1841, p. 125.

Alcedo (subgenus *Ceryle*, Boie, 1828,) *rudis*, Lin.; *Ispida bicincta*, Swainson, *Nat. Lib., Orn.*, viii. 95. "When we find all authors," writes Mr. Swainson, "affirming that the black and white Kingfisher 'inhabits various regions, both of Asia and Africa, Egypt, Persia, Senegal and the Cape of Good Hope—that it varies both in size and in the particular mixture of its colours,' it is impossible not to conclude that more than one species is confounded under the common name of *Alcedo rudis*, and that in all probability this mixture of black and white in the plumage, instead of being the character of a species, more probably belongs to a small division of the genus. The bird now before us," he continues, "affords at least a confirmation, in one instance, of such a supposition. All writers (see particularly Edwards, i. pl. ix., Buffon, Edit. Sonnini, xx, 192, and *Pl. Col.* 716,) agree in stating, that the true *Alcedo rudis* of the Cape of Good Hope has but one black belt on the breast, whereas the species now before me has *two*; when, therefore, we find so strong a specific distinction between birds inhabiting two localities so comparatively near to each other as Senegal and the Cape, we may fairly conclude that the other black and white Kingfishers, of regions vastly more distant, will eventually prove to be equally distinct." The truth happens to be, that the double-banded is merely the male, and the single-banded the female, of this widely diffused species, which is included among the birds of Europe by Mr. Gould, as an inhabitant of its south-eastern border. It is of frequent occurrence in Bengal, and follows the whole course of the Gauges to the foot of the Himalaya. Dr. McClelland met with it in Assam, and it is included in the catalogue of birds procured by Dr. Royle at Saharunpore and in the Himalayas, as an inhabitant of the plain country. It is also plentiful about Rangoon. Mr. Jerdon states it to be "common all over India, frequenting brooks, rivers, and tanks: unlike the other Kingfishers," he adds, "which watch their prey from a fixed station and then dart down obliquely on it, the Spotted Kingfisher searches for its prey on the wing, hovering over a piece of water like some of the Terns, and then darting down perpendicularly on it." (*Mad. Jour.* xi. 232). So, indeed, does the common British Kingfisher (*A. ispida*), very commonly, and doubtless, also, its Indian near ally (*A. Bengalensis*), at least occasionally, though I have never observed this of it. Mr. Strickland, again, who remarked the *A. rudis* in Syria, informs us, that "it may be often seen in the salt-water marshes west of Smyrna:" there, however, "it never seems to follow the rivers, but always remains near the coast. It sometimes hovers for several minutes about ten feet above the water, and then drops perpendicularly on its prey" (*P. Z. S.* 1836, 100). Such are precisely its habits in Bengal; and it may not unfrequently be seen resting on the bank, and jerking its tail at intervals. Together with the large Himalayan *A. guttatus*, this species appertains to a well marked subdivision of true Kingfishers (the *Ceryle*, Boie, or *Ispida*, Sw.), generally characterized by large size, chiefly black and white plumage, and considerably longer wings and tail than in the subgroup exemplified by *A. ispida*, *Bengalensis*, *semitorquatus* (Sw.), &c.; hence they might be expected to seek their prey more on the wing, conformably with the foregoing observations. It is remarkable that this subgenus is the only one not only of the family *Halcyonidæ*, but of a larger natural group comprising the latter, which is represented by species in the New World. The males of *A. rudis* vary in the development or breadth of the second pectoral band, and in the quantity of spotting in front of the neck, above the first band, which latter is sometimes interrupted in the middle, as it generally is in the females; these

have no trace whatever of the second band, and seldom any spotting in front of the neck, but a patch on the flanks (a little anterior to the thighs) is equally developed in both sexes.*

Cuculus fugax, Horsfield, or *Bychan* Cuckoo of Latham; *C. Latham*, Gray and Hardwicke, or *Bhrow* Cuckoo of the latter, being evidently a mode of spelling the Bengalee form of the Hindee word for "great," which is applied by the natives to this species in contradistinction to certain others, as more especially the *C. tenuirostris*, Gray and Hardwicke, which latter, I may remark, is not identical with *C. Sonnerati*, vel *Himalayanus*, Vigors, as supposed by Mr. Jerdon, but is the same as his doubtfully cited *C. flavus*, this again being quite different from the *C. flavus*, Auctorum. Upon another occasion, I will endeavour to elucidate the various Indian and Malayan species of the family *Cuculidae*.

Calliope Latham, Gould (*Icones Avium*) ; *Motacilla Calliope*, Pallas ; *Turdus Calliope*, Latham ; *Accentor ! Calliope*, Temminck. A beautiful male, added to the female which was exhibited at the last meeting. This bird extends eastward to Kamtschatka and Japan. It is not included in any of the published catalogues of the species of Southern India ; but Lieut. Tickell notices it in his ' List of birds collected in the Jungles of Borabbum and Dholbhum' (*J. A. S. ii.* 575), as "rare, solitary, and silent. Haunts thickets and underwood. Was found at Dampera in Dholbhum, and at Jehanabad, west of Hoogly." As we had a specimen previously in the Museum, in addition to those now obtained, it is probably not very rare in the vicinity of Calcutta during the hyemal months.

Salicaria (Selby, subdivision *Acrocephalus*, Naumann, v. *Calamoherbe*, Boie,) *turdoides* (?) ; *Turdus arundinaceus* (?), Lin. ; *Agrobates brunnescens*, Jerdon, *Mad. Jour.* No. xxv. 269. This appears to me, judging from memory, to be the *Sylvia turdoides* of Temminck, which according to that naturalist extends eastward as far as Japan. I have seen a specimen that was purchased in the London market, where, however, it may have been brought from Holland ; the species not having been hither-

* In the same work in which Mr. Swainson has elevated the male of this bird to the rank of a different species from the female, finding, as he says, "so strong a specific distinction," he startles the common-place observer by characterising "the Spotted-winged Pintado, or Guinea-hen, (*Numida maculipennis*, Swainson). All the authors we have consulted agree," he informs us, "in stating that the common Pintado, or Guinea-fowl, has the greater quills of the wings *white*, and although we have not, at this moment, an opportunity of verifying this, it *cannot for a moment be reasonably doubted* that such is the universal character of the species (!!!). That, however, which we shall now record, has the whole of the primaries spotted on a blackish ground, precisely with the same pattern, and in the same manner, with the lesser quills. *This is the only material difference we can detect between the bird before us and the ample descriptions which have been published of the common species.* Of this latter, however, we have procured some feathers, which enable us to state, that those of the lesser quills and of the back are spotted [in a manner] precisely similar to those of our present bird. The difference, however, of the quills *is so important, that it is alone sufficient to separate them as species.*" !!! What a pity "the first Ornithologist of any age" did not defer the publication of the above until he had visited some poulterer's shop, or farm-yard ! He would then have found that domestic Guinea-fowl with spotted primaries are at least as common as those with white ones, while among the latter he would have remarked that scarcely any two agreed in the quantity of white exhibited, a variation, too, of all others wherein any but a mere pretender to the rank of a philosophic naturalist would have paused before venturing to emburthen science after such a fashion.

to detected within the British islands. Here the present bird, which I believe to be the same, is not uncommon.

Phillopneuste fuscata, Nobis. This appears to me to be a new species. Length $5\frac{3}{8}$ inches, extent $7\frac{3}{8}$ inches, wing from bend $2\frac{3}{8}$ inches, and tail $2\frac{1}{8}$ inches; bill to forehead $\frac{7}{16}$ inch, and $\frac{5}{8}$ inch to gape; tarse above $\frac{7}{8}$ inch; 1st primary $1\frac{1}{8}$ inch shorter, and 2nd primary $\frac{3}{8}$ inch shorter, than the 4th, which is longest; tail slightly rounded, in which respect, as in others, this species approximates the *Salicaria*. General colour nearly uniform dusky greenish-brown above, somewhat darker upon the crown; beneath pale, and whitish on the throat and middle of belly; shoulders of the wings beneath, and under tail-coverts, tinged with fulvous, as also the flanks slightly, and a trace of the same upon the breast and ear-coverts; a pale streak over the eye, commencing at the nostril. Irides dark brown. Bill dusky above, yellowish at base of lower mandible; inside of the mouth rather pale yellow: legs greenish-brown. Shot in the neighbourhood.

Ibis Macei, Cuvier and Wagler; *I. religiosa* of Sykes's catalogue, and confounded by others with the venerated Ibis of ancient Egypt, to which it is nearly allied: a male and female, of the age described as *Tantalus melanocephalus*, Latham, and figured as *Ibis melanocephalus*, Stephens, by Messrs. Jardine and Selby, *Ill. Orn.* pl. cxx.

Ardea Javanica.

Also numerous *Totani*, *Tringæ*, &c. of which the following species occur in the bazaars; those marked with a † being common to this country and the British islands. *Totanus glottoides*, very common; *T. Horsfieldi* (*Limosa Horsfieldi*, Sykes), do.; †*T. fuscus*, not rare; †*T. calidris*, very common; †*T. glareola*, excessively abundant; †*T. ochropus* and †*T. hypoleucos*, apparently rare, at least I have seen neither of these in a fresh state as yet, though we possess specimens from the neighbourhood; †*Machetes pugnax*, common; †*Tringa subarguata*, tolerably common; †*T. platyrhyncha*, rare; †*T. minuta*, exceedingly abundant; †*T. Temminckii*, not rare; *Eurynorhynchus griseus*, a specimen of this excessively rare and curious species in the Museum (vide *J. A. S.* v. 127, and *As. Res.* xix. 699); *Terekia orientalis*, occasionally met with; †*Limosa melanura*, common; †*Numenius arquatus*, do.; †*Himantopus melanopterus*, do.; †*Recurvirostra Avocetta*, not rare; †*Scolopax Gallinago*, very abundant; †*Sc. Gallinula*, much less so; *Sc. heterura*, tolerably common; *Rhynchea Capensis*, abundant (one species only); †*Squatarola cinerea*, common; *Charadrius Virginianus*, do.; (†*Ch. morinellus*, of this we have an old and much injured specimen, apparently set up when fresh;) †*Ch. minor* (v. *hiaticuloides*, Franklin, v. *Phillipensis*?, v. *pusillus*? Horsfield), common; another and larger species of Ring Plover, as yet undetermined, do.; *Pluvianus Goensis* and *Pl. bilobus*, not rare*; *Parra Sinensis*, very common in the immature plumage; *P. Indica*, much less so,—the young of this has no superciliary white stripe, and otherwise differs so much from the adult that I suspected it to be distinct before procuring a specimen in transitional state of plumage; †*Fulica*

* Since writing the above, I have met with another and (I think) a new species, *Pl. cinereus*, Nobis; and there is also an undetermined species, with very fornidably spurred wings, in the Museum, which I am told is occasionally met with.

atra, common; †*Gallinula chloropus*, do.; *G. Javanica* v. *phænicura*, do.; *Porphyrio smaragnotus*, do.; †*Porzana maruetta* (*Gallinula porzana*, Lin.), do.; †*P. Baillonii*, do.; *P. rubiginosa*, comparatively rare; †*Rallus aquaticus*, do.; *R. Javanicus*, do.: fine picked specimens of nearly all these birds have been procured, and series of some of them illustrating their various phases.

†*Podiceps minor* has been added to the collection, which previously contained only specimens of †*P. cristatus*; the former is very common in Bengal.

Lastly, several species of *Anatidæ* have been procured, of which the following occur in the bazaars: †*Anser cinereus* (verus), not rare; *A. Indicus*, common; *Dendrocygna major*, Jerdon, somewhat rare; *D. Awsuree* (*Mareca Awsuree*, Sykes), abundant; *Microcygna Girra*, do.; †*Casarca rutila*, do.; †*Tadorna Bellonii*, rare; *Plectropterus melanotos*, not common; *Anas pæcilorhyncha*, do.; *A. caryophyllacea*, do.; †*A. querquedula*, extremely abundant; †*A. crecca*, hardly less so; †*A. acuta*, common; †*A. Penelope*, somewhat rare; †*A. stepera*, common; †*A. clypeata*, do.*; †*Fuligula rufina*, not rare; †*F. ferina*, do.; †*F. nyroca*, extremely common; †*F. cristata*, somewhat rare. I trust soon to have handsome and well mounted specimens of all these species in the Museum.

Altogether, 69 specimens of recently killed birds have been set up since the last meeting of the Society, in addition to some skins. Several skeletons of birds are also in process of preparation, a few being likewise included in Mr. Masters's donation. The same gentleman has also presented the Society with a few skins of birds from Tipura; consisting of common Bengalese species, with the exception of a beautiful Trogon, which I believe is the *Tr. Hodgsonii* of Mr. Gould, unfortunately, however, in very frail condition, as are also the others.

Reptilia, &c.

As so very many species have lately demanded my attention in the two warm-blooded classes of vertebrated animals, it will rightly be surmised that comparatively small progress has been made in investigating any other department, howsoever desirous I might feel to neglect none whatever, but to bestow the same attention upon all. This will, of course, become more practicable in process of time, when I shall have successively paid that especial attention to each class in its turn, which hitherto I have found it impossible to do in more instances than those of the Mammalia and Birds. I defer, therefore, at least as a general rule, bringing forward what observations I may have to offer relative to objects appertaining to other departments of Zoology, until such time as I shall have brought my mind to bear, for a while, exclusively upon the particular group or groups, and thus have become more familiarized with the state of knowledge concerning such in this country. On the present occasion, I have only to mention that the skin of the Crocodile noticed in my last Report has been mounted, and its bones cleaned, the latter being intended to be kept separate, for purposes of reference and comparison; and that the donation received

* The *A. Boschas* I have never yet obtained, nor is it included in the catalogues of Messrs. Franklin, Sykes, and Jerdon; but it is found in the Himalaya, though also unnoticed in Dr. Royle's list.

from Mr. Masters contains a stuffed skin of a small *Python Tigris*, and another of a large specimen of *Tropidonotus Dora*, or *Coluber Dora* of Russell, vel *Tr. quincunciatus*, Schlegel, this latter being a very common species in the neighbourhood.

In the same collection was likewise a species of Sponge : and a large Madreporæ has been presented to the Society by Mr. T. P. Harding.

I am, Sir,

Yours obediently,

ED. BLYTH,

Curator, Asiatic Society.

Thanks were voted for the various communications.

The following are the names of the Society's Officers elected at this Meeting, for the year 1842.

President.

The Honorable H. T. PRINSEP, Esq.

Vice Presidents.

The Honorable Sir J. P. GRANT,

„ „ W. W. BIRD, Esq.

„ „ Sir H. W. SETON,

The Right Rev. the LORD BISHOP of Calcutta.

Members.

Major W. N. FORBES,

Dr. N. WALLICH,

Dr. J. HÆBERLIN,

Dr. H. H. SPRY,

C. HUFFNAGLE, Esq.,

Rev. J. H. PRATT,

Dr. J. T. PEARSON,

Lieut. A. BROOME,

Baboo l'ROSONOCOOMAR TAGORE.

